Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

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DOUGLAS McKAY, Secretary

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JOHN L. FARLEY, Director

Commercial Fisheries Abstracts

Prepared in the Branch of Commercial Fisheries

EDITORS

A. W. ANDERSON, Chief, Branch of Commercial Fisheries

DONALD Y. ASKA, Chief, Educational and Market Development Section

ASSOCIATE EDITOR

MAURICE E. STANSBY, Chief, Pacific Coast and Alaska Technological Research

ASSISTANT EDITORS

F. BRUCE SANFORD, Chemist, Seattle

KATHRYN L. OSTERHAUG, Fishery Products Technologist, Seattle

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In addition to the regular abstracts, there is included a bibliography of references of secondary importance (without abstracts). These may be cut off on the lines designated and pasted on standard 3 x 5-inch cards for filing.

Following is a brief outline of this filing system. The numbers apply to the first digit appearing on each card. For the meaning of subsequent digits, please see the above described leaflet.

0	General and theoretical	5	Vitamins
1	Fish by species	6	Fishery byproducts
2	Fresh fish	7	Analytical Methods
3	Preserved fish	8	Composition
4	Oils	9	Miscellaneous

Issued with the approval of the Bureau of the Budget, December 29, 1953

0.32 THE ALKALINE HYDROLYSIS OF HADDOCK ACTOMYOSIN.
I. AMMONIA FORMATION

Nottingham, P. M.
Journal of the Science of Food and Agriculture 6, No. 2, 82-86 (February 1955)

This investigation was undertaken to obtain information about the influence of temperature and alkali concentration on amino-acid decomposition and peptide-bond hydrolysis during the alkaline treatment of fish proteins. The study was carried out with haddock-muscle proteins. Haddock actomyosin was primarily used, since actomyosin is the major and best characterized protein fraction of fish muscle. Preliminary studies indicated that (1) there was no significant difference in the rate of alkaline hydrolysis of haddock and herring actomyosin, globulin X and myogen, and (2) the alkaline hydrolysis of the total proteins of minced whole herrings proceeded similarly to that of the individual protein fractions.

The results of the determinations of the evolution of ammonia during alkaline hydrolysis of haddock actomyosin at a number of temperatures and alkali concentrations indicated that ammonia formation depended more on temperature than on the alkali concentration. Higher concentrations of alkali gave a more rapid rate of ammonia formation in the earlier stages of hydrolysis, but the maximum formation depended on temperature.

To compare results, ammonia formation from hydrolysis with hydrochloric acid at 70° and 100° was studied. The amide groups of glutamine and asparagine were quickly hydrolyzed, but apparently little other amino-acid decomposition takes place except at high acid concentrations and temperatures.

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 ABSTRACTER: Neva L. Karrick

0.32 THE ALKALINE HYDROLYSIS OF HADDOCK ACTOMYOSIN.
II. PEPTIDE-BOND HYDROLYSIS

Nottingham, P. M.
Journal of the Science of Food and Agriculture 6, No. 2, 86-90 (February 1955)

The acid and alkaline hydrolysis of haddock actomyosin was studied by the determination of free amino acids and free amino groups. Hydrolysis with 5N-sodium hydroxide gave lower maximum values for free amino acids than hydrolysis with 6N-hydrochloric acid. This difference was due to the decomposition of certain amino acids during alkaline hydrolysis. The extent of this decomposition was determined at various temperatures and alkali concentrations.

Amino-acid decomposition depended more on temperature than alkali concentration, but peptide-bond hydrolysis was influenced more by the alkali concentration. The liberation of free amino groups and free amino acids reached a maximum with 5N-sodium hydroxide at 100° and 90°. The value for free amino acids from alkaline hydrolysis was much lower than that from acid hydrolysis. The free amino groups were also lower but the difference was less than that for the amino acids.

Possibly the difference in values for free amino acids and free amino groups found on complete acid hydrolysis is due to differences in estimation of certain of the amino acids by the two methods. On alkaline hydrolysis some amino acids decompose and form other α-amino acids. However, the amino part of the molecule remains unchanged, and the decomposition of these amino acids does not account for the major part of the difference in value for free amino groups on acid and alkaline hydrolysis.

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COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 8 PAGE 1
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE. ABSTRACTER: Neva L. Karrick

0.32 ELECTROPHORETIC STUDIES OF PROTEINS EXTRACTABLE FROM POST-RIGOR COD AT LOW IONIC STRENGTH

Dingle, J. R.; Eagles, D. E.; and Neelin, J. M. (Atlantic Fisheries Experimental Station, Halifax, N. S.)
Journal of the Fisheries Research Board of Canada 12, No. 1, 75-84 (January 1955)

Experimental. -- Commercial fillets cut from cod 80 to 100 centimeters in length were used. Preparations were obtained by mixing unbuffered water or 0.1M-sodium chloride with an equal weight of cod muscle that had been minced in an ordinary food chopper and allowing the mixture to stand unstirred overnight. In earlier experiments, 100 grams of cod fillet were homogenized in a Waring blendor with 350 milliliters of 0.1M-sodium chloride for about one minute. The mixture was then centrifuged at 680 x gravity. The resulting extract was moderately opalescent and contained 0.44 ± 0.08 grams of protein nitrogen per 100 grams of muscle used. Aliquots of the extract were dialyzed for electrophoresis in Visking cellulose tubing against sodium-chloride phosphate solutions of total ionic strength 0.15 (NaCl = 0.10M). Electrophoresis was carried out in a Klett Tiselius apparatus at 0.8° C. with the analytical cell. Photographic records were obtained by using the Longsworth schlieren scanning technique with nearly monochromatic light of λ = 580 mμ. All dialyzed samples were centrifuged at 750 x gravity for 15 to 20 minutes before pouring them into the cell.

Results. -- Typical patterns found for extracts made with the Waring blendor are reproduced in figures 1 to 4 omitted. At pH values above 6.1, such patterns always showed a prominent turbid peak, and the turbidity was frequently such that the slower peaks were obliterated in the ascending limb. For this reason, only the patterns from the descending limb are shown. Electrophoresis patterns obtained from aliquots of a single extract dialyzed to various pH values at an ionic strength of 0.15 are reproduced in figure 5, this card, over.

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COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 8 PAGE 1
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE. ABSTRACTER: Martin Heerdt

0.38 FISH MUSCLE RIBOSIDE HYDROLASES

Tarr, H. L. A. (Pacific Fisheries Experimental Station, Vancouver, B. C.)
Biochemical Journal 59, No. 3, 386-391 (March 1955)

Crude riboside hydrolase enzymes were prepared from muscles of lingcod (Ophiodon elongatus) or rock cod (Sebastodes sp.) in rigor. The muscle was extracted at 0° C. with cold 0.5-0.6 molar sodium chloride or potassium chloride at pH 4.6, and the preparation (extract) obtained was fractionated with ammonium sulphate at pH 7. Most of the enzyme activity was found in the fraction obtained between 0.4 and 0.6 saturation. For purification, the crude preparations were stirred with Amberlite cation-exchange resin XE 64 at pH values slightly above 7, eluted with sodium chloride, and dialyzed. Zone electrophoresis showed that crude preparations contain 2 and occasionally 3 proteins, whereas the purified preparations contained only one protein zone.

The most highly purified enzyme preparation that the author was able to obtain hydrolyzed guanosine over 1,500 times as actively on a protein nitrogen basis as did whole muscle (table 1, over). The purified preparations contained two distinct enzymes. These were (1) a non-specific riboside hydrolase with a pH optimum of about 5.5 that hydrolyzed purine ribosides and cytidine, and (2) a specific inosine hydrolase with a pH optimum of 8.0. The author did not separate these two enzymes from each other. These enzymes were not able to hydrolyze either riboside 1-phosphate or riboside 5-phosphate, however nucleoside hydrolysis was able to proceed in the absence of added inorganic phosphate.

D-Ribose diphenylhydrazone and xanthine were isolated from a reaction mixture of guanosine and crude riboside hydrolase.

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COMMERCIAL FISHERIES ABSTRACTS VOL. VIII NO. 8 PAGE 1
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE. ABSTRACTER: Martin Heerdt

HYDROLYSIS OF HADDOCK ACTOMYOSIN

ELECTROPHORETIC STUDY OF COD PROTEIN

PEPTIDE-BOND HYDROLYSIS

FISH-MUSCLE RIBOSIDE HYDROLASES

0.32 (Cross Reference: 1.5)

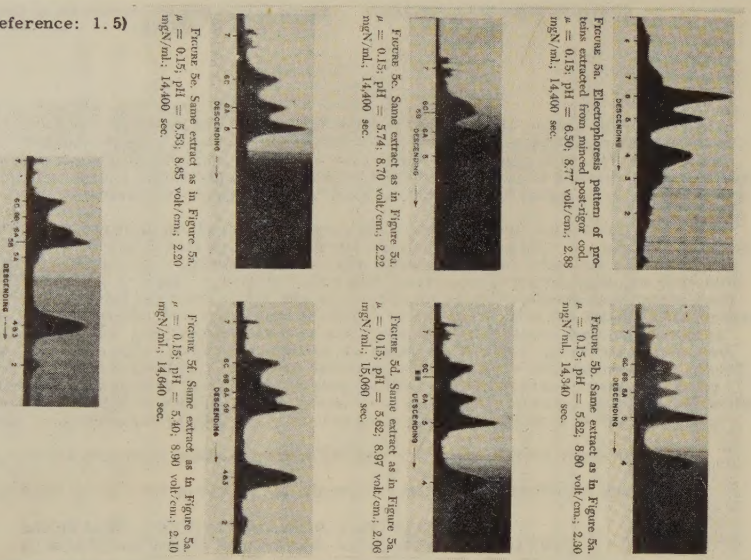

Figure 5a. Electrophoresis pattern of proteins extracted from minced post-rigor cod. μ = 0.15; pH = 6.50; 8.77 volt/cm.; 2.85 mgN/ml.; 14,400 sec.

Figure 5b. Same extract as in Figure 5a. μ = 0.15; pH = 5.82; 8.80 volt/cm.; 2.30 mgN/ml.; 14,340 sec.

Figure 5c. Same extract as in Figure 5a. μ = 0.15; pH = 5.74; 8.70 volt/cm.; 2.22 mgN/ml.; 14,400 sec.

Figure 5d. Same extract as in Figure 5a. μ = 0.15; pH = 5.62; 8.97 volt/cm.; 2.06 mgN/ml.; 15,060 sec.

Figure 5e. Same extract as in Figure 5a. μ = 0.15; pH = 5.53; 8.85 volt/cm.; 2.20 mgN/ml.; 14,400 sec.

Figure 5f. Same extract as in Figure 5a. μ = 0.15; pH = 5.40; 8.90 volt/cm.; 2.10 mgN/ml.; 14,640 sec.

Figure 5g. Same extract as in Figure 5a. μ = 0.15; pH = 5.26; 9.01 volt/cm.; 2.02 mgN/ml.; 15,320 sec.

0.38 (Cross Reference: 8.59)

Activity tests showed that freeze-dried enzyme preparations were fairly stable for short periods.

Table 1. *Comparative activity and recovery of riboside hydrolases*

Blended whole muscle (3 g.) at natural pH 6·6 + nucleoside solution or water (1 ml.) formed the following amounts of ribose in 1 hr. at 37°: control, 220; guanosine, 290 and inosine, 620 μg./g. (1 g. $\simeq$ 28 mg. protein N). The crude enzyme (0·5 mg. protein N ml. final concentration) formed 1700 μg./ml. of ribose from guanosine and 1000 μg./ml. from inosine in 3 hr. at 37° in 0·1 M acetate buffer pH 5·0. The freeze-dried purified preparation (0·04 mg. protein N/ml.) formed 1070 μg./ml. of ribose from guanosine and 1080 μg./ml. from inosine in 3 hr. at 37° in 0·1 M acetate buffer pH 5·5, while the other purified preparation (0·085 mg. protein N/ml.) formed 520 μg./ml. of ribose from guanosine in 6 hr. under similar conditions. Neither crude nor purified enzyme preparations formed ribose in absence of added nucleosides.

Preparation studied	Ribose (μg.) formed in 1 hr. at 37° by 1 mg. of protein N*		Ribose (mg.) formed by 100 g. of original muscle or by the quantity of enzyme recovered from that amount of muscle†	
	Inosine	Guanosine	Inosine	Guanosine
Muscle	23·8	11·1	38·8	82·9
Crude enzyme	666 (28)	1134 (102)	28·4 (73)	16·6 (20)
Purified enzyme (freeze-dried)	8830 (370)	8930 (805)	4·2 (10·8)	4·12 (4·97)
Purified enzyme (not freeze-dried)		17 400 (1582)	—	4·70 (5·67)

* The figures in parentheses refer to the increase in activity in terms of that of the whole muscle.
† The figures in parentheses denote the actual percentage of the initial riboside hydrolase activity of the muscle which could be accounted for in given enzyme preparations.

0.32 (Cross Reference: 1.5)

On prolonged hydrolysis at 25° with 5N and N-sodium hydroxide, ammonia in excess of the amide ammonia was formed, possibly due to the decomposition of arginine. At 70° with 5N-alkali, the ammonia values were equivalent to the sum of amide- and ammonia nitrogen. At higher temperatures, the ammonia produced by even the most dilute alkali, was higher than this amount. Serine, threonine, cystine and methioine are decomposed with the formation of ammonia on heating in alkaline solution.

At 70°, a lower protein concentration results in a higher rate of ammonia evolution. In the early stages of hydrolysis, more ammonia was formed in N-sodium hydroxide with 10 percent protein than in 0.1N-alkali with one percent protein. In later stages, this was reversed. This may be due to side reactions, possibly between ammonia and some of the other products, so free ammonia values do not indicate the full extent of the hydrolysis.

The alkaline hydrolyzates of haddock actomyosin were analyzed by paper chromatography procedures. Amounts of threonine, cystine, methionine, and serine were reduced on alkaline hydrolysis. However, the excess of ammonia could not be correlated with the loss of amino nitrogen that occurred on alkaline hydrolysis.

0.32 (Cross References: 1.5, 7.52)

Since serine, threonine, and cystine also decompose and release ammonia with a decrease in α-amino nitrogen, it might be expected that the decrease in free amino groups would result in the formation of an equivalent amount of ammonia. However, the ammonia found in excess of amide- and arginine-ammonia was not enough to account for the observed decrease. This may be because the ammonia was removed from the solution by reaction with some of the hydrolysis products. Since this reaction, and thus the amount of free ammonia, probably depends on the total concentration of ammonia, it is reasonable that the formation of excess ammonia and amino acid decomposition are not related.

1.2 HERRING -- THE PORK OF THE SEA

Cutting, C. L. (Food Investigation Organization, Humber Laboratory, D.S.I.R., Hull, England)
Food Manufacture 30, No. 3, 113-116 (March 1955)

Primitive methods of preservation. -- Herring, presumably salted, are mentioned in the inland monastary account books of Anglo-Saxon times. Norwegian sagas at the end of the tenth century also refer to herring. By the twelfth century the English, notably at Yarmouth, as well as the Scots, French, and Dutch were all fishing for and preserving herring. The first really concentrated fishery was at the western end of the Baltic Sea at Scania (Schonen) on the extreme southwest tip of Sweden which was then under Danish control. Here the trade in herring was monopolized by German merchants from towns in the Hanseatic League, which owed much of its prominence to herring. The actual fishing was conducted by the Danes from small boats which carried from 3 to 6 men. Each large Hanse town, Lubeck, Danzig, Stettin, etc., had its own fishing area on the Scania peninsula. Here the merchants camped during each season to salt and pack herring.

Improved methods. -- The fishermen on the Zierikzee on the East Schelde are reported to have been the first to pack herring in barrels at sea. Fishermen of the Biervliet on the West Schelde in the southern part of Zeeland near Flushing are reported to have been the first to eviscerate herring before salting in order to obtain better preservation. It has been repeatedly stated that a Dutchman by the name of William Beukels revolutionized the technique of salting herring around the end of the fourteenth century. The essential features of the improved Hanseatic methods were rigid specifications backed by strict supervision to insure a properly prepared commodity.

The grand fishery. -- With the decline of the Baltic fishery, the Dutch forged ahead and for several centuries practically monopolized the international trade in bulk herring. These herring were

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 ABSTRACTER: Martin Heerdt

1.85 FREEZING OF PRAWNS

Anonymous
Food Preservation Quarterly 15, No. 1, 18 (March 1955)

In Australia, most prawns are marketed as cooked, whole fresh prawns in ice. By contrast, in the United States, most prawns and shrimp are marketed uncooked and headed or peeled. A fairly large percentage of these uncooked shrimp are frozen for market. The quantity of shrimp cooked prior to freezing is small because frozen, cooked shrimp toughen and lose their flavor rapidly. Frozen, cooked shrimp do have the advantage of being ready to eat after they have been thawed. The adverse effects of frozen storage on cooked shrimp may be reduced if the shrimp are held at a very low storage temperature for a minimum length of time. Frozen, uncooked headed shrimp packed in Australia should be acceptable for sale in the United States. Special packs may also be made of the shelled flesh, the yield of which will be about one-half the weight of the whole shrimp.

In the United States, where the shrimp catch averages about 80,000 tons a year, machinery is used to wash and remove the sand vein. In some cases, the shrimp are also peeled or shelled by machinery. The type of equipment and methods used for packaging and freezing shrimp have been described in Fisheries Newsletter 12, No. 12, 11, 13 (1953) and 13, No. 1, 11, 15 (1954).

Frozen shrimp keep longer if they are flooded with fresh or sea water and frozen in blocks. This method is disadvantageous in that it adds to the weight of the package and increases transportation costs. Plate freezers are best for producing regular-shaped frozen packages, but a fairly well-shaped frozen package can be obtained if the shrimp are frozen on refrigerated shelf coils in a freezer room.

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 ABSTRACTER: Martin Heerdt

1.85 MARKING OF SHRIMP

Menzel, R. Winston
Science 121, No. 3143, 446 (March 25, 1955)

According to a proposal by the U.S. Fish and Wildlife Service, shrimp tags in order to be effective should fulfill these conditions: (a) should not impede the natural movements of the shrimp, (b) should not damage any tissue of the shrimp, (c) should offer minimum opportunity for the entry of pathogens into the tissue, (d) should not attract predators, (e) should persist throughout the life of the shrimp, and (f) should easily be detected and identified by untrained workers in the fisheries.

Some preliminary investigations of the usefulness of vital staining for this purpose were made at the Marine Laboratory of the Oceanography Institute, Florida State University during October 1954. The shrimp placed in tanks 10 feet in diameter were supplied with running sea water and were fed at infrequent intervals. A 2-milliliter insulin-type syringe with a No. 25 1/2-inch needle was employed, using several different colored inks and stains prepared for histological purposes. The injections were made by piercing the shell in the posterior abdominal segment. Except when almost immediate death occurred, the stain spread throughout the shrimp almost instantaneously, presumably via the blood vascular system.

With the exception of neutral red and methyl blue, the majority of the stains killed the animals either immediately or within several hours. However, because of their temporary nature, neither neutral red nor methyl blue were considered satisfactory. Fast green was very successful with less than 5 percent mortality if the shrimp were handled carefully and not too much stain was injected. With an estimated 0.2 milliliter solution injected, the color was still plainly visible after more than 60 days, however, after shedding the stain became concentrated in the branchial area but was still

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 ABSTRACTER: Harold C. Johnson

1.5 THE SABLEFISH FISHERY OF BRITISH COLUMBIA

Ketchen, K. S. and Forrester, C. R. (Pacific Biological Station, Fisheries Research Board of Canada)
Pacific Marine Fisheries Commission, Bulletin 3, 58-72 (1954), Portland, Oregon

During the past 40 years the Canadian fishery has on the average accounted for about one-quarter of the annual production of sablefish (Anopoploma fimbria) from the waters of the northeast Pacific. A substantial increase in fishing effort has taken place during the past decade and there is now a question as to whether the stocks are being overfished. The purpose of this report was, through the compilation and analysis of existing information, to determine whether or not the records of catch indicate any extensive changes in abundance.

Summary of findings. -- The sablefish fishery reached an important economic status during World War I. Production declined following the war due to reduced demand and reached a low point in the early thirties. A growing demand for fish livers and the shortening of the halibut season caused production to rise slowly but steadily. A sharp impetus was felt during World War II, caused by a sharp rise in price. Due to a decline in the fish-liver market and periodic overproduction, the yield has declined since the end of the war.

There has been a steady increase in the importance of the northern grounds over the years. Prior to 1930, the majority of landings were made in southern British Columbia ports. This has declined to an average of 30 to 40 percent in recent times. During World War II, the southern fishery did not expand to the same extent as the northern fishery. This suggests that these grounds are producing to or beyond their capacity.

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 ABSTRACTER: Kathryn L. Osterhaug

HISTORY OF SALTED AND SMOKED HERRING

MARKING OF SHRIMP

FREEZING PRAWNS FOR EXPORT

B. C. SABLEFISH FISHERY

1.85 (Cross Reference: 9.12)

very noticeable. Mortality (15 percent) was about the same as in the other controls kept in the same tank.

These preliminary data satisfy conditions a, c, and f. Condition b, "should not cause tissue damage," is not fulfilled although it is thought the damage to the tissue is slight. It will not be known whether condition d, "should not attract predators," is fulfilled until controlled experiments are performed, and it is not known whether the color will persist throughout life to fulfill condition e.

It is felt that if stains are prepared carefully so that isotonic solutions are made and no toxic substance used for carriers, this method of marking will prove effective. If a variety of contrasting colors can be found it will become possible to tag in several localities the same year, and because of the short life span of shrimp they can be repeated within two years.

One difficulty with this method is that individual records cannot be kept, hence although valuable for migration studies, it is not as suitable for growth studies. However, great numbers of shrimp of restricted size interval could be marked in a short period with a single color. The growth under natural conditions could be determined when the shrimp were captured.

1.5 (Cross Reference: 9.17)

Both the northern and southern grounds have changed in abundance during the past two decades. The catches per unit of effort are now only 2/3 of their value during the thirties.

On most of the coastal fishing grounds the period of most decline in catch per skate was between 1944 and 1947. Since then a condition of relative stability has occurred. The catch per skate on grounds off southeastern Alaska is now at a level 40 percent higher than that off the west coast of the Queen Charlottes and in Queen Charlotte Sound and 100 percent higher than off Cape Flattery.

Because of the absence of information on growth and mortality rates in the sablefish stocks contributing to the British Columbia fishery, it is impossible to say whether present exploitation is under or over the optimum level for maximum yield.

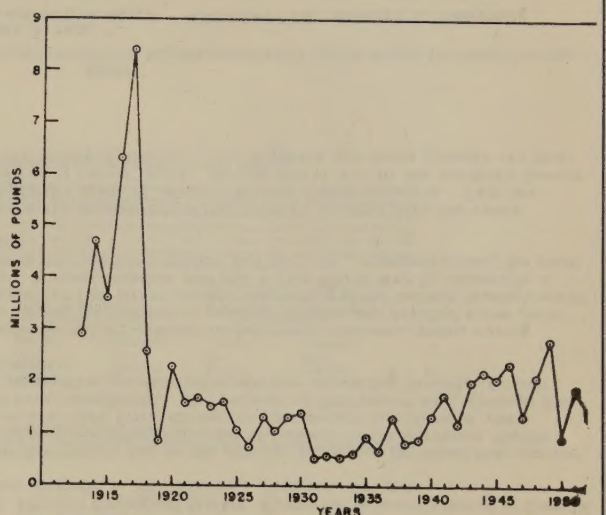

FIGURE 1. The total annual landing of sablefish in British Columbia as reported in the Fisheries Statistics of Canada.

1.2 (Cross References: 3.4, 3.5)

caught under the very eyes of the Scots and English off the Shetland Islands and northeast Scotland in the summer and East Anglia in the autumn, just as they are today. Distance made it essential to salt the herring at sea. For this work, a large seaworthy decked vessel known as a "buss" was developed to carry a crew of 15 men. During the first half of the seventeenth century at the peak of the industry over 2,000 of these busses were in use, and nearly half a million persons were employed directly or indirectly.

The Dutch process. -- The real secret of the Dutch process was the stringent regulations regarding standards of quality for salt herring. Immediately after the herring were shaken from the drift net onto the deck of the vessel, they were "gipped" by removing the gills, and the alimentary canal through an incision in the throat. The gipped herring were then sprinkled with salt, roused, and packed head to tail in barrels with salt sprinkled between layers that were arranged alternately across one another. The barrels were then topped up, made air tight (to minimize oxidative rancidity), and stamped with the date of catch. Herring could not be sold until they had been in pickle for at least 10 days. Repacking on shore had to be complete within 3 weeks of landing.

The British red herring. -- The British developed the characteristic red herring in which Yarmouth was preeminent. Red herring are made by salting ungutted herring and then subjecting them to thorough smoking and dehydration to yield a product that is dark-brown, hard as a board, and saturated with salt. During the seventeenth and eighteenth centuries successive British governments cast envious eyes on the success of the Dutch. The first severe check to the Dutch fishery was applied through the naval prowess of Blake. In 1653, the entire Dutch herring fleet of some 2,000 vessels was kept at home. In 1702, four French men-of-war defeated an entire Dutch convoy and burned 400 vessels of the Dutch fleet at Bressay Sound in the Shetland Islands. The quality of Dutch salted herring began to decline by the end of the seventeenth century. With the end of the Napoleonic wars, Scotland became within a century the greatest herring-curing nation in the world.

1.85 (Cross Reference: 3.234)

Shrimp should be washed, graded, and frozen as soon after catching as possible. In the event of delay, they should be immediately stored in adequate amounts of crushed ice. Raw, frozen shrimp should not be held in storage at 0° F. for longer than 3 months or in storage at 10° F. for longer than 1 1/2 months. Flooded shrimp that have been frozen in a block will keep for 4 months and 2 1/2 months, respectively, at 0° and 10° F. If the shrimp are cooked prior to freezing, their storage life will be about two-thirds as long as the storage life of raw, frozen shrimp.

2.1121 MID-WATER TRAWL EXPERIMENTS

Anonymous
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 102, 19 (March 1955)

The first phase of the mid-water trawl experiments conducted by the Fisheries Research Board of Canada at the Pacific Biological Station was completed in February with fairly successful preliminary results. Funds from the Industrial Development Vote financed the tests conducted aboard the chartered vessel Sea Pride II for the 5-week period.

The net, constructed almost entirely of nylon twine and rope, has a working gap of 35 by 35 feet. The otter boards, of a novel design, are suspended quite differently from those of a conventional trawl. This gear, designed by Mr. Wesley W. Johnson, was found to be very effective at night when numerous catches of 10 to 35 tons of herring were made in 15- to 20-minute drags on schools of herring located entirely off the bottom at depths from 15 to 35 fathoms. Catches in daylight were much lighter (averaging 1 to 2 tons) than those made during the night when drags were made on comparable concentrations of fish. However, two daylight drags on a large school located in mid-water, at depths between 40 and 50 fathoms, yielded 15 and 35 tons. Further tests are planned for the coming summer off the west coast of Vancouver Island. A detailed report on the gear and preliminary experiments will appear in the near future.

 ABSTRACTER: Harold C. Johnson

2.05 THE EFFECT OF SALT, VINEGAR, AND HEAT ON THE COLIFORMS IN OYSTERS

Salafranca, Enrique S. (Bureau of Fisheries, Manila)
Philippine Journal of Fisheries 2, No. 1, 93-107 (January-June 1953)

Solutions containing 10-, 15-, 20-, and 25-percent rock salt (99.45-percent sodium chloride); 10-, 15-, 20-, and 25-percent Malabon solar salt (82-percent sodium chloride), and 10-, 15-, 20-, 25-, and 30-percent vinegar (3.47-percent acetic acid) were tested for their effect on total bacteria and coliforms in aseptically shucked oysters held at room temperature, 37°, and 45° C. Temperature (room temperature, 37°, 45°, 59° to 61°, and 99° to 101° C) was also tested for its effect on total bacteria and coliforms. Coliforms in oysters subjected to salt solutions were destroyed in 24 to 120 hours, whereas those in oysters subjected to vinegar solutions were destroyed in 24 to 72 hours. The concentrations used in both solutions were rather high for palatability and the destruction time was too long to be of practical value. Temperatures of 59° to 61° C. and 99° to 101° C. in the oyster mass itself were effective in destroying coliforms within 1 hour and within 15 minutes, respectively. For practical application, 99° to 101° C. is the only temperature that could be maintained without special apparatus.

 ABSTRACTER: Martin Heerdt

2.14 THE TRAWL FISHERY ON THE PACIFIC COAST OF CANADA

Hart, J. L. (Pacific Biologication Station, Fisheries Research Board of Canada, Nanaimo, B. C.)
Proceedings of the 7th Pacific Science Congress IV, 425-27 (1949) Auckland, New Zealand

The first recorded trawling to take place in British Columbia waters was done about 1911 from a 40-foot boat powered with a 16 to 18 h.p. gasoline engine. The fishery was primarily for lemon sole which were sold in the round rather than as fillets.

From about 1920 and on, the other common species of fish caught (except gray cod) were marketed even though the fishery was mainly for lemon sole.

By 1940, trawling was experiencing a marked increase due to the expanding wartime demand for food fish and the increasing profits from dogfish livers. Attracted by the financial prospects, the trawl fishery grew rapidly. In recent years the frozen-fillet industry has kept trawling a lucrative British Columbia fishery.

Table 1 lists the more common species taken commercially by trawlers in British Columbia.

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 ABSTRACTER: Kathryn L. Osterhaug

2.3 BUILT-IN SANITATION

Snyder, Walter F. (National Sanitation Foundation, Ann Arbor, Michigan)
Journal of the American Dietetic Association 31, No. 2, 119-123 (February 1955)

Despite the availability of adequate modern equipment outbreaks of food poisoning occur, 95 percent of which are caused by failure of the human element. All people who handle food -- the dishwasher, the management of an institution, and the public -- must understand and practice habits of superior modern sanitation. The problems of cleanliness and sanitation are unending, as old problems must be kept under control while new problems constantly arise.

Good sanitation includes not only the measurement and removal of filth, but preplanned prevention of every possible unclean, unsafe condition in the environment. This theory of sanitation calls for an environmental approach to health. Sanitation is more than a means to survive, as through milk, water protection, etc., it is also a means to thrive. The "creed" of the environmental approach to health states that a combination of good equipment plus personnel that understand the need for and want to practice sanitation is necessary to a flow of safe food.

Challenging modern sanitation are problems of a changing society and economic conditions. For example, a change in methods of production of food products creates new problems. Education of the average American to want and work for sanitation for the benefits it brings is the answer to a positive program for superior sanitation. New opportunities for health and better living are available through superior cleanliness and sanitation.

The National Sanitation Foundation was founded to provide a common forum through which lay, business and professional groups can work. Of its seven-point program, the food protection program

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 ABSTRACTER: Lois Elgin

2.14

TABLE 1.–PERCENTAGE OF THE MORE COMMON SPECIES IN THE COMMERCIAL LANDINGS BY TRAWLERS

Common Name	Scientific Name	1946	1947 Oct. 1946–Oct. 1947	1948 Nov. 1947–Oct. 1948
Lemon sole	*Parophrys vetulus*	14·1	10·4	12·6
Rock sole	*Lepidopsetta bilineata*	9·6	29·0	11·3
Brill	*Eopsetta jordani*	8·4	15·5	38·9
Starry flounder	*Platichthys stellatus*	4·2	2·6	1·0
Butter sole	*Isopsetta isolepis*	18·6	2·7	3·6
Rex sole	*Glyptocephalus zachirus*	1·0	0·4	0·8
Dover sole	*Microstomus pacificus*	2·9	6·6	0·8
Sand sole	*Psettichthys melanostictus*	—	0·1	0·1
Long-jaw flounder	*Atheresthes stomias*	—	—	+
Unclassified flatfish		10·0	5·4	7·6
Grey cod	*Gadus macrocephalus*	13·7	12·2	6·0
Lingcod	*Ophiodon elongatus*	9·7	4·8	7·1
Rockfishes	*Sebastodes* spp.	3·7	1·3	0·5
Skate	*Raja binoculata*	0·3	0·6	0·3
Perch	*Damalichthys vacca*	0·1	0·1	+
Dogfish liver	*Squalus suckleyi*	2·9	4·9	4·7
Black cod	*Anoplopoma fimbria*	0·1	+	0·2
Hake	*Merluccius productus*	0·1	—	+
Whiting	*Theragra chalcogramma*	0·1	+	—
Ratfish liver	*Hydrolagus collei*	0·4	+	+
Herring	*Clupea pallasi*	—	—	4·1
Octopus	*Polypus hongkongensis*	0·1	+	+
Crab	*Cancer magister*	—	0·1	+
Other species, "mink feed" which includes a substantial amount of young flatfish, etc.		—	3·1	0·4

2.3

of the nation and the testing laboratory and seal-of-approval program are of special interest. The food-protection program sponsors the efforts of organized groups to educate the public to share sanitary food practices wherever food and drink might be prepared or served. The ultimate goal is to encourage people to know the value of and to demand quality food well-prepared and served in a clean and sanitary manner. The Foundation recommends that existing sanitation ordinances and codes be made uniform and be reevaluated in the light of present-day knowledge and needs. A guide or manual would be needed to insure uniform conditions and offer suggestions for the successful adherence to the ordinances.

2.1121 (Cross Reference: 1.2)

2.05 (Cross Reference: 1.81)

3.5 EXPERIMENTAL VIEW-POINTS ON ROPINESS OF FISH BRINE

Lindeberg, Gösta
Symposium on cured and frozen fish technology, Swedish Institute for Food Preservation Research, Göteborg, No. 100, Chapter 13 (November 1953)

Icelandic herring caught during the summer from July to October is packed on board the ships in wooden kegs with the addition of (1) salt, (2) salt and sugar (sucrose), or (3) salt, sugar, and spices.

The sugar-containing brines in the kegs as well as the sauces of the final preserves (tidbits etc.) sometimes become ropy. The appearance of ropiness is unpredictable, a rare phenomenon for years then, suddenly, very common for a season. On the same ship it may affect some kegs while others are completely free of it, although the kegs and their contents are apparently identical in all other ways.

Most people agree that ropiness occurs only in sugar-containing brines. In some cases it is said to be combined with gaseous fermentation.

Although the herring from ropy brine can usually be recovered there is always the risk of its recurrence in the finished product. In any case the extra work means economic loss to the packer.

If progress is to be made in the scientific prevention of ropiness in brines the following questions must be answered: (1) What is the chemical nature of the slime? (2) Which organism or organisms cause the slime formation? (3) Under which conditions is the slimed formed? (4) Are there any substances which inhibit the slime-formation, preferably in a selective way, and is there any such substance that could be used as a preservative?

(over)

 ABSTRACTER: Kathryn L. Osterhaug

3.4 PREPARATION OF SMOKED SALMON CAVIAR SPREAD

Carlson, Clarence J. (Fishery Products Laboratory, Ketchikan, Alaska)
Commercial Fisheries Review 17, No. 1, 13-15 (January 1955)

Method of preparation. -- The following procedure was used in the preparation of experimental packs of smoked salmon caviar spreads: Skeins of chum-salmon eggs that had been frozen in 30-pound berry tins and stored at 0° F. from 1 to 12 months were allowed to thaw in air. The skeins were then removed from the tin and immersed in 95-degree salinometer brine (2.8 pounds salt per gallon of water) for 25 minutes. After being drained, the brined eggs were placed on smoking trays that were covered with greased aluminum foil. The eggs were smoked for 2 1/2 hours at 115° to 120° F.

The eggs were then removed from the smokehouse and allowed to cool. They were passed through a hand-operated corn-mill-type grinder, and the resultant slurry was finally strained through 16-mesh wire screen. The recovery of strained smoked-egg liquor from raw frozen salmon eggs averaged 60 percent.

The basic formula for the smoked spread was smoked-egg liquor, 4.5 pounds; salt, 0.23 pounds; garlic salt, 3 teaspoons; and pepper sauce, 1 teaspoon.

The salt, garlic salt, and pepper sauce were added to the egg liquor, and the ingredients were mixed together, then poured into 2 3/8-ounce jars. The rubber-gasketed lids were screwed on tightly, and the jars were immersed in water at 197° F. for 1 hour.

(over)

 ABSTRACTER: F. Bruce Sanford

3.237 SOME FACTORS AFFECTING THE COLOR OF FISH STICKS

Holston, J. (Fishery Technological Laboratory, U. S. Fish and Wildlife Service, East Boston, Mass.)
Commercial Fisheries Review 17, No. 1, 11-13 (January 1955)

Scientifically, color is measured in terms of hue, brilliance, and saturation. Preliminary studies at the Boston laboratory indicated that, in the case of fish sticks, hue and saturation were determined in large part by the composition of the breading and that the cooking times and temperatures primarily affected the brilliance (or shades between black and white).

For comparisons of brilliance, a number was assigned to each shade of fish-stick color. A very pale product differing little from the uncooked product was rated 1, whereas a very dark product, not quite burnt, was rated 10. Shades in between were given intermediate numbers. (The shade preferred by the testers was 6.)

Results of experiments. -- The effect of cooking time and oil temperature upon the shade of color is given in table 1. These data show the importance of close control of cooking times and oil temperatures in the production of a uniform shade of fish-stick color.

The effect of variation of breading composition on the color shade attained by fish sticks fried in oils maintained at different temperatures and on the cooking time is given in table 2. These data show that as the ratio of bread crumbs to wheat cereal base mix was increased, the shade of color obtained at a particular temperature and cooking time was deepened.

The hue of the finished stick was primarily determined by the type of breading material. Breading mixes based on cracker meal resulted in a golden-yellow hue; those based on wheat, a golden-brown

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 ABSTRACTER: F. Bruce Sanford

3.5 STUDIES ON THE SALT CONCENTRATION OF COMMERCIALLY DRIED (TUYO) AND SMOKED (TINAPA) HERRING

Uyenco, V.; Rodriguez, P.; and Taruc, R. (Bureau of Fisheries, Manila)
Philippine Journal of Fisheries 2, No. 1, 85-91 (January-June 1953)

Three species of herring dried and smoked in the Philippine Islands are tunsoy (Sardinella fimbriata), lapad (Sardinella perforata), which are made into tuyo or into tinapa, and tamban (Sardinella longiceps) which is made into tinapa. Tuyo is the trade name for dried herring; tinapa is the trade name for smoked herring. To prepare tuyo, fresh herring are brine salted in the round and dried in the sun. To prepare tinapa, fresh herring are dipped in boiling dilute brine for a few minutes and then smoked.

The tuyo that is found in the market is very salty. Some of the fish processors erroneously resort to oversalting in an attempt to improve stale or slightly tainted herring. The object of this paper is to learn more about the salt concentration of dried and smoked herring.

Experimental method. -- For this study, dried herring and smoked herring were selected at random from the wholesaler's baskets in the city market. Each lot, which consisted of 25 to 30 pieces of herring, was divided into two portions. One portion was cooked in the usual native way of serving dried herring and smoked herring, for sampling by the taste panel. The other portion was used for analyses. The taste panel classified the herring into five degrees of saltiness.

Only the edible herring were used for analysis. These were finely chopped so homogeneous samples could be obtained. The vacuum oven method at 100° C. was used to determine moisture and the "Open Carius Method" of the A.O.A.C. was used to determine salt. The panel opinions and the

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 ABSTRACTER: Martin Heerdt

ROPINESS IN FISH BRINE

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SALT IN DRIED AND SMOKED HERRING

3.237

hue; and those based on bread crumbs, a reddish-brown hue. Fish sticks prepared from bread crumbs darkened the fastest, whereas those prepared from cracker meal failed to deepen in shade noticeably even during extended cookery.

The "age" of the frying oil also had a noticeable effect upon the color shade. With very fresh oils, a light shade was obtained. When the oil had been in use for a short time, the oil darkened slightly, and the color shade of the fish sticks was also slightly darker than that of fish sticks cooked in fresh oil.

Summary. -- Factors of importance governing the hue and brilliance of fish-stick color are (1) the composition of the breading, (2) the cooking times and oil temperatures, and (3) the "age" of the oil. For continuing uniformity of shade and color, close control must be maintained over cooking times and oil temperatures.

Table 2 - Effect of Variation in Composition of Breading Material on the Shade (Brilliance of Color) of Fish Sticks at Different Oil Temperatures.

Bread Crumb-Breading Material Ratio 1/	Shade (Brilliance of Color) Cooking Temperatures (° F.) 360 2/	375 3/	390 4/	405 4/
	(Shade No.)			
0:1	4	4	3	5
1:2	6	6	5	6
2:1	7	7	6	8
1:0	8	9	8	9

1/ Proportions of bread crumbs added to standard breading materials.
2/ Cooking time was 90 seconds.
3/ Cooking time was 75 seconds.
4/ Cooking time was 45 seconds.
Note: For definition of shade gradations, see note 1, table 1.

Table 1 - Effect of Cooking Time and Oil Temperature on the Shade (Brilliance of Color) of Fish Sticks

Cooking Time	Shade (Brilliance of Color) 1/ Cooking Temperature (° F.) 360	375	390	405
Minutes	(Shade No.)			
¼	2	3	3	5
1	3	4	5	6
1½	4	4	6	7
1½	4	6	8	8
2	5	7	8	-
2½	7	-	-	-
3	8	-	-	-

1/ The color shade designations (1 to 10) were arbitrarily developed specifically for this experiment (and, possibly, a few succeeding experiments). A very pale product, differing little from an uncooked item, merited designation "1." A very dark product, not quite burnt, merited a "10." A moderately-dark product was given a "7," while a moderately-light-colored product was rated at "4." Lithographed pictures of fish sticks on commercial labels were used as guides for the range "4" to "7." The shades of color rated as acceptable to one or more members of the laboratory staff ranged from about "3" to "8." The shade preferred by the average panel member was about "6."

3.5 (Cross References: 0.5, 1.2)

After filtering the ropy brines through glass wool, the slime substances were precipitated and reprecipitated several times with alcohol. The purified products did not reduce Fehling's solution. However, after heating with dilute acid, reduction occurred. The nitrogen content was about 0.9 percent in the purest samples. The results of the tests indicate that the slime probably consists of levan.

In order to identify a specific slime causing bacterium as the cause of ropiness the following conditions must be fulfilled: (1) The bacterium must be isolated from ropy brine, and (2) be able to form slime in a nutrient solution containing sucrose in the concentration found in the brine. The slime formed in the original brine and in the nutrient solution should have identical properties.

Several slime forming bacteria have been isolated from ropy brines but they have not always formed slime in sucrose-containing nutrient solutions.

A bacterium that is capable of forming levan slime in sucrose-containing medium has been isolated. Its properties seem to be identical with those of Microbacterium lacticum (as described by Orla-Jensen, 1919) with the following exceptions: (1) the thermoresistance is lower, (2) levan is formed on sucrose and raffinose, and (3) inulin is fermented.

Prevention of ropy brine formation. -- There are several possible approaches to the problem of preventing slime formation in herring brine: (1) A primary approach is the prevention of infection of the brine with the slime-forming bacteria. Investigations on this question are in progress. (2) As levan is formed only from sucrose or raffinose, ropy brine might be prevented by substituting another sugar for sucrose. This would be a costly solution. (3) Some preservative that would prevent the development of the bacteria might be added to the brine. (4) The fact that slime-forming bacteria seem to be unable to develop in "normal," slime-free, ripened brine suggests the possibility that such brines may contain antibiotic substances. Perhaps such substances could be used to prevent the formation of ropy brines.

3.5 (Cross References: 3.4, 1.2)

results of the analyses appear in table 1, below.

Results and discussion. -- All except one of the samples of dried herring shown in table 1 were oversalted, whereas most of the samples of smoked herring had the right amount of salt. The authors purchased fresh herring and held them in a saturated brine of Paranaque salt at room temperature to determine the immersion time necessary when preparing dried herring. Good dried herring were found to contain 8- to 10-percent sodium chloride and to have 25- to 30-percent moisture. This desired salt concentration can be obtained if the herring are immersed in saturated brine at room temperature for 30 to 40 minutes before they are dried.

TABLE 1.—*Moisture and sodium chloride analysis of dried (tuyo) and smoked herring (tinapa).*

[D-Dried (tuyo): S-smoked (Tinapa); L-lapad; T-tunsoy. Example: DL-8 means dried 'lapad' lot 8; ST-9 means smoked 'tunsoy' lot 9.]

Panel test: Rating		Moisture: Tuyo	Moisture: Tinapa	Sodium chloride: Tuyo, Fresh	Sodium chloride: Tuyo, H_2O free	Sodium chloride: Tinapa, Fresh	Sodium chloride: Tinapa, H_2O free
		Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Very salty	D -1	43.62	.....	14.50	25.75	.....	.....
	DT-7	47.70	.....	12.72	24.41	.....	.....
	DL-8	43.42	.....	12.61	21.80	.....	.....
	DT-9	47.56	.....	12.02	22.14	.....	.....
In between "very salty" and salty	DL-4	46.40	.....	14.69	27.14	.....	.....
	D -2	43.57	.....	13.72	24.35	.....	.....
	DL-5	39.89	.....	13.24	22.37	.....	.....
	DT-4	41.46	.....	12.06	20.55	.....	.....
Salty	DT-5	45.50	.....	12.21	22.48	.....	.....
	DL-3	41.48	.....	11.70	20.43	.....	.....
	S -2	.....	52.69	.....	.....	10.40	22.01
In between salty and just right	DT-8	41.77	.....	11.87	20.51	.....	.....
	DL-7	41.88	.....	11.27	19.36	.....	.....
	DT-6	47.04	.....	7.78	14.72	.....	.....
	SL -8	.....	59.93	.....	.....	10.50	26.55
	S -1	.....	51.64	.....	.....	9.40	19.49
	SL -3	.....	57.21	.....	.....	9.36	21.87
Just right	DL-6	44.24	.....	9.22	16.54	.....	.....
	SL -4	.....	55.30	.....	.....	7.31	16.35
	ST -8	.....	63.81	.....	.....	6.93	18.81
	SL -7	.....	57.16	.....	.....	6.69	15.62
	SL -6	.....	64.64	.....	.....	6.48	18.36
	ST -5	.....	59.30	.....	.....	6.41	15.74
	SL -5	.....	60.16	.....	.....	6.00	15.10
	ST -7	.....	67.59	.....	.....	5.14	15.87
	ST -4	.....	58.75	.....	.....	5.00	12.12
Flat		.....	.....	.....	.....	.....	.....

3.4 (Cross Reference: 3.5)

The spread was bright reddish-orange and was creamy and smooth-textured. It spread easily; had a mild, smoky taste; and was easily blended with other foods, such as cream cheese, for variety or to reduce the high salt content. The proximate analysis is given in table 1.

Keeping quality. ---Normally a product of this type must be kept refrigerated to minimize the possibility of bacterial growth, such as of Clostridium botulinum. Since the need for refrigeration would limit sales, experiments were conducted to improve the keeping quality so that the spread might be stored safely at room temperature for a year or longer.

Products having a pH below 4.5 or having a salt content above 8 percent will not, in most cases, support the growth of Clostridium botulinum. However, when the pH of the spread was lowered from its normal 5.6 to 4.4, a sour taste was quite noticeable. On the other hand, a spread having a salt content as high as 9.5 percent was still of acceptable taste.

To check the possible hazard of botulism, the author packed a smoked caviar spread (composition given in table), inoculated it with Clostridium botulinum, and submitted it to the National Canners Association Laboratory at Berkeley, California. The laboratory concluded that this smoked-salmon egg spread, with a salt content greater than 8 percent, presents no hazard when stored at room temperature.

Storage tests of this spread, at room temperature for 1 year, have shown that a strong flavor develops as the time of storage progresses. Although the off flavor is not excessive, it does detract from the quality of the product. Tests are now underway to see if the use of antioxidants will aid in the prevention of off flavors.

Table 1 - Proximate Composition of a Spread Prepared from Chum-Salmon Eggs

	Percent
Protein 1/	27.6
Moisture 1/	45.7
Ash 1/	10.0
Oil 2/	10.1
Carbohydrate 3/	6.6
Salt (as NaCl)	8.7

1/ Analyses according to modified Methods of Analysis of the Association of Official Agricultural Chemists (1950).
2/ Analysis according to the method of Stansby and Lemon (1937) as modified by Voth (1946).
3/ By difference.

4.11 HIGH UNSATURATED FATTY ACIDS. II. FRACTIONATION BY UREA INCLUSION COMPOUNDS

Abu-Nasr, Ahmed M.; Potts, William M.; and Holman, Ralph T.
Journal of the American Oil Chemists' Society 31, No. 1, 16-20 (January 1954)

1. Urea segregation has been found to be a useful tool in concentration of highly unsaturated acids and esters. Fatty acids and esters derived from fish oils and methyl esters of hog adrenal fatty acids have been fractionated, and the polyunsaturated acids have been enriched (figures 1, 2, and 4, over).

2. The tendency for fatty acids and esters to combine with urea decreases with increasing unsaturation. Combination is favored by lowered temperature. Polyunsaturated acids are concentrated in the final filtrate whereas esters of these acids appear in the final inclusion compound fractions. Fatty acid concentrates have been obtained with iodine values ranging from 294 to 356. Bound esters exhibited iodine values as high as 338.

3. The increased chain length brought about by esterfication has a minor role in increasing the yield of inclusion compounds. Likewise, shifting of the terminal polar group in an acid toward the center of the molecule by esterfication does not explain the higher yield of inclusion compound from esters.

4. The improved tendency of esterfied acids to form urea inclusion compounds is probably due to blocking of association of acid groups. This effect is found in unsaturated acids and in short chain saturated acids. In long chain saturated acids and esters this effect is not noticed. Both give high yields of inclusion compounds because the effect of the carboxyl group is overshadowed by the high energy of formation contributed by the long carbon chain.

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Authors' summary

4.12 IDENTIFICATION OF FATS BY UREA FRACTIONATION

Shipe, W. F. (Cornell University, Ithaca, New York)
Journal of the Association of Official Agricultural Chemists 38, No. 1, 156-164 (February 15, 1955)

Fatty acids account for about 90 percent of the weight of most fats. Pronounced differences between various fats can usually be attributed to differences in the fatty acid distribution. Urea fractionation has provided a new method for determining these differences.

The present study was made to determine if specific fats can be identified by urea fractionation. Experimental procedures are given for the preparation of samples of butter and cream, for the saponification and extraction of fatty acids, for fractionation with 10 percent urea, and for fractionation with 20 percent urea. To check the selectivity of the fractionation procedure, the refractive indices of the various fractions were measured.

The type and amount of fatty acids that was precipitated by urea complex formation was found to be dependent on the urea concentration. Pure capric and caprylic acids were not precipitated by a 10-percent methanolic urea solution, although some capric acid was precipitated. A 15-percent urea solution precipitated most of the capric, some of the caprylic, but none of the caproic acid. A 20-percent urea solution precipitated some of all three acids. Capric acid was the most completely precipitated, and caproic acid the least. None of the butyric acid was precipitated by 20-percent urea solution but increasing amounts of oleic acid were precipitated as the urea concentration was increased.

The foregoing observations showed the effect of urea concentration on the fractionation of the fatty acids from various fats. Fatty acids from hydrogenated soybean meal, hydrogenated coconut oil, and butter fat were fractionated with 10, 15, and 20-percent urea in methanol, and the refractive indices

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 ABSTRACTER: Martin Heerdt

4.19 STUDY OF PHARMACEUTICAL AND OTHER INDUSTRIAL PRODUCTS FROM SALMON EGGS

Kyte, Robert M. (Fishery Products Laboratory, Ketchikan, Alaska)
Commercial Fisheries Review 17, No. 2, 14-15 (February 1955)

The free-oil droplets in pink salmon (Oncorhynchus gorbuscha) eggs, which consist of about 1/3 of the total lipid in the eggs, were extracted by grinding the eggs, mixing with warm brine, allowing the oil phase to separate, decanting, and clarifying by centrifuging. Analysis of this oil showed it to contain a large percentage of highly unsaturated fatty acids with 20 and 22 carbon atoms and 3 to 6 double bonds. The component fatty acids of the pink salmon egg oil, along with those of other competitive oils, are listed in table 1.

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 ABSTRACTER: D. T. Miyauchi

4.11 THE STORY OF UREA COMPLEXES

Marschner, Robert F. (Standard Oil Company, Whiting, Indiana)
Chemical and Engineering News 33, No. 6, 494-496 (February 7, 1955)

When urea and a n-alkyl react, only as much heat is given off as when the alkyl condenses from the vapor to liquid state. Thus, complex formation is a physical process. X-ray spectra shows that when urea complexes, the structure of the urea changes from a tetragonal form to a hexagonal form in which the urea molecules are arranged spirally. Since all six edges of each hexagon are common to 3 spirals, the center of the spirals is the only space left for the n-aklyls (illustrated in the accompanying figure, over).

There are at least 2 other complexes similar to those of urea. The first are the complexes of desoxycholic acid. X-ray studies show that choleic acid hold n-alkyls in canals situated lengthwise to the crystals. The other complexes similar to urea are those of amylose. X-ray patterns suggest a hexagonal helix of glucose units wrapped around a chain of the material being complexed.

Other substances can no doubt also form complexes. Three types are theoretically possible: (1) channel (like those with urea), (2) cage, and (3) layer (as illustrated in the accompanying figures). There is growing evidence that all 3 of these types exist.

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 ABSTRACTER: F. Bruce Sanford

UREA FRACTIONATION OF FISH OILS

FAT FRACTIONATION WITH UREA

FATTY ACIDS FROM SALMON EGGS

THE STORY OF UREA COMPLEXES

4.12

after fractionation were determined and used as an indication of the composition of each fraction. The original fatty acid was called the A fraction; the filtrate, the B fraction; and the precipitate, the C fraction. With soybean oil, the B fraction values were greater than the A fraction values, whereas C fraction values were smaller. With coconut oil the B fraction values were less than the A values, and the C fraction values were greater than the A values. With butter fat, both the B and C fraction values were greater than the A values. Therefore, if the results are expressed in terms of a ratio of B-A values to C-A values, negative values are obtained for soybean and coconut oil and positive values for butter fat. Furthermore, the ratio $B_{20} - A/C_{20}$ was more differentiating than the ratio $B_{10} - A/C_{10}$-A.

The slopes of the plots of the different fats also were differentiating. Plots of the refractive indices of soybean oil and butter fat have positive slopes, whereas plots of the refractive indices of coconut oil have negative slopes. Furthermore, although the plots for the B and C fractions of butter fat and coconut oil are approximately parallel, the plots for the B and C values of soybean oil are radically different. These differences may be emphasized by expressing the result in terms of the ratio $B_{20} - B_{10}/C_{20} - C_{10}$, or the ratio of the slopes of the B and C plot curves. Refractive indices of the original oil (fraction O) and of the fatty acids also were different and characteristic for each fat. In rearranged fats, the refractive index of the original oil was altered; whereas the refractive index of the fatty acids was the same. Therefore, an abnormal O - A value might be indicative of a rearranged fat.

A scheme of analysis for detecting adulteration in butter fat is presented. As a result of this study urea fractionation has been shown to have potentiality for characterizing fats.

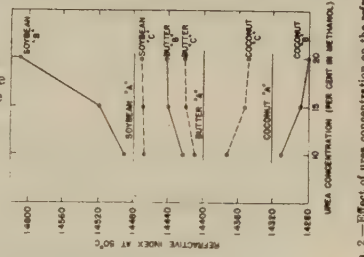
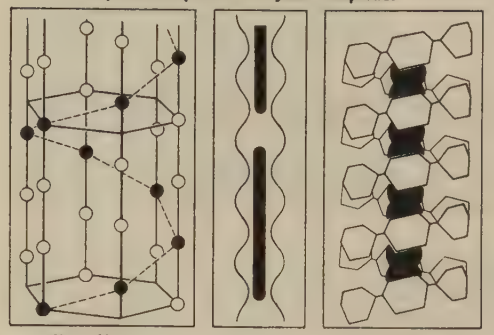
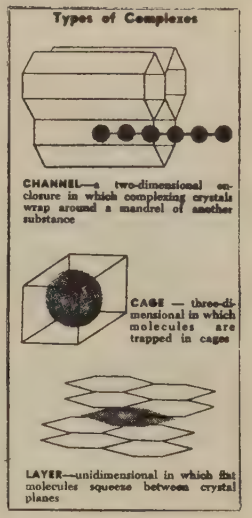


Fig. 2.—Effect of urea concentration on the refractive index of fatty acid fractions.

4.11

Spatial Complexes of Organic Compounds




Types of Complexes
CHANNEL—a two-dimensional enclosure in which complexing crystals wrap around a mandrel of another substance
CAGE — three-dimensional in which molecules are trapped in cages
LAYER—unidimensional in which flat molecules squeeze between crystal planes

4.11

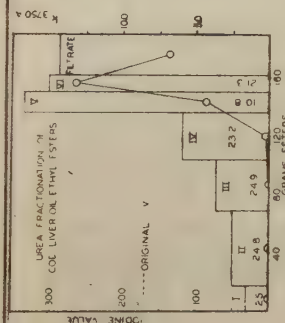


Fig. 1. Urea fractionation of cod liver oil ethyl esters. Weight of bars indicates weight of fractions, and numbers indicate iodine values. Circles indicate relative base peaks as measured at 8750 A after alkaline isomerization. Numbers within bars refer to ester content (%) of total precipitate.

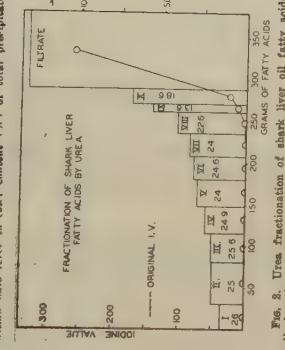


Fig. 3. Urea fractionation of shark liver oil fatty acids. Explanation of figure is the same as for Figure 1.

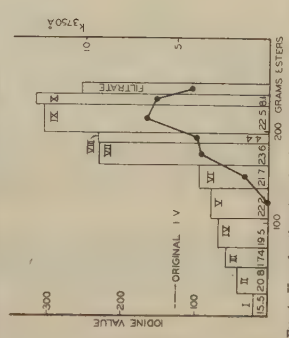


Fig. 4. Urea fractionation of cod liver oil butyl esters. Explanation of figure is the same as for Figure 1.

TABLE I
Segregation of Polyunsaturated Acids From Fish Oil Sources

	Original fatty acids	Final filtrates
	I.V.	I.V.
Cod liver	159.3	350.0
Shark liver	140.0	327.0
Pollaok liver	155.5	322.0
Herring	148.0	294.0
Salmon	150.5	325.5
Myvarine industrial	122.0	312.5
Menhaden	167.0	358.0

4.19

Table 1-Component Fatty Acids of Several Oils

Fatty Acid	Pink Salmon Egg Oil	Menhaden Oil 1/	Tallow (Ox) 1/	Cottonseed Oil 1/	Soybean Oil 2/
	(Percent by Weight)				
C_{14} saturate	1.8	6.0	3.0	3.0	Trace
C_{14} monounsaturate	0.1	-	-	-	-
C_{16} saturate	8.3	16.0	29.2	20.0	9.7
C_{16} monounsaturate	5.1	15.5	2.7	-	0.4
C_{18} saturate	1.9	1.5	21.0	1.0	2.4
C_{18} monounsaturate	10.5	-	41.1	30.0	29.7
C_{18} higher unsaturate	20.8 (4.4H)	30.0 (4.0H)	1.8 (4.0H)	45.0 (4.0H)	56.9 (4.2H)
C_{20} saturate	-	-	0.4	1.0	0.9
C_{20} unsaturate	31.1 (7.3H)	19.0 (10.0H)	0.2	-	-
C_{22} unsaturate	14.7 (11.8H)	12.0 (10.0H)			
C_{24} unsaturate	0.2				
Unresolved	5.5		0.6		
Total	100.0	100.0	100.0	100.0	100.0

1/ Hilditch (1941) 2/ McLeod (1951)

Note: The numbers in parenthesis are a measure of the unsaturation and indicate the atoms of hydrogen required to completely saturate the fatty acids.

6.3 THE PRESERVATION OF SEAWEED BY ENSILING AND BACTERICIDES

Black, W. A. P.
Journal of the Science of Food and Agriculture 6, No. 1, 14-23 (January 1955)

Seaweeds decompose more rapidly than land plants. In an attempt to preserve these plants for use as feed for farm animals or for later chemical processing, preservation experiments have been carried out.

In America, fresh Laminaria digitata is preserved by storing it in large tanks with sea water, added salt, and formalin. A 1937 British patent describes the preservation of algae by impregnating it with sulfur-dioxide gas. The normal procedure for preserving seaweed is by drying.

Studies on the preservation of grass and forage crops have established that it is necessary to check respiration as quickly as possible and to prevent subsequent fermentation if chemical changes are to be kept at a minimum. The most practical system is ensiling with the addition of acid to lower the pH.

The ensiling of seaweed was studied at both the laboratory and the pilot plant levels. Seaweeds support a vigorous lactic-acid fermentation and can be ensiled without inoculation or the addition of fermentable carbohydrates.

Chemical changes which take place during the ensiling of seaweed depend on the initial composition of the material, which in turn depends, to some extent, on the time of year it is harvested. For instance, with L. cloustoni, marked changes in chemical composition occur with the seasons while with A. nodosum very little change occurs -- the only significant one being an increase in non-protein

(over)

 ABSTRACTER: Kathryn L. Osterhaug

6.52 WEIGHT RANGE, PROXIMATE COMPOSITION, AND THIAMINASE CONTENT OF FISH TAKEN IN SHALLOW-WATER TRAWLING IN NORTHERN GULF OF MEXICO -- TECHNICAL NOTE NO. 31)

Lee, Charles F. and Nilson, Hugo W. (U. S. Fish and Wildlife Service, College Park, Maryland); and Clegg, William (U. S. Fish and Wildlife Service, Seattle, Washington)
Commercial Fisheries Review 17, No. 3, 21-23 (March 1955)

A few years ago a canned cat food plant was opened in Pascagoula, Mississippi based on the utilization of the small shrimp-trawl trash fish that formerly were discarded.

Due to the wide acceptability of this product, production facilities were expanded. The shrimp-trawl trash fish supply was soon found to be both inadequate and irregular. Additional boats were put into service to satisfy demands.

Numerous species are found in a typical catch. Skates, crabs, and shell are culled on the boat and discarded. Marketable fish are removed and sold separately. A second cull takes place in the canning plant.

The present work was undertaken in order to obtain information regarding the potential utilization of this scrap fish for fur animal feed in the North Central States.

The table lists species, fish weight, proximate composition, and the thiaminase level for 19 species. In two lots, croaker was found to be the most common species, making up about 75 percent of the catch. Spot, scup (porgy), sea robin, and sea catfish made up most of the remaining 25 percent. The protein content ranged from 13.5 percent (squid) to 20.0 percent (razor belly). The oil and ash

(over)

 ABSTRACTER: Max Patashnik

6.3 TOXIC MARINE ALGAE AND PROPERTIES OF THE TOXIN

Fraser, Ian M.; Habekost, Robert C.; and Halstead, Bruce W. (College of Med. Evangelists, Loma Linda, California)
Federation Proceedings 14, No. 1, Part I, 340 (March 1955)

Water extracts of a number of temperate and marine algae have been found to be toxic to mice. The species concerned were Macrocystis pyrifera Harvey, Gelidium cartilagineum var. robustum Agardh, Pelvetia fastigiata Gardner, Hesperophycus harveyanus Gardner and Egregia laevigata Setchell from the Southern California coast and mixtures of Lyngbya majuscula Gomont and Bryopsis pennata var. secunda (Harvey) Collins and Hervey, of Boodlea composita (Harvey) Brand and Caulerpa serrulata (Forskal) Agardhl emend. Borgesen, and of Turbinaria ornata (Agardh) Kutzing with small amounts of several other algae including epiphytes, from Palmyra Island. Some concentration of the toxic principle(s) has been achieved and a number of the simple physical and chemical properties determined.

 Reprinted in whole

6.190 THE COMPOSITION OF WHALE-MEAT MEALS OF VARIOUS GRADES

Pritchard, H. and Cawthorne, M.
Journal of the Science of Food and Agriculture 6, No. 3, 148-153 (March 1955)

Whale meals are roughly separated into grades in the United Kingdom. Grade A whale-meat meals are pure meat meals with low mineral contents and a protein content from 80 to 85 percent. Grade B meals are meat and bonemeal mixtures with a protein content from 40 to 65 percent. These meals contain more oil and ash than those of Grade A. Grade C meals are mainly bonemeals with a protein content about 20 percent.

Average samples of the three grades were obtained to check variation in their composition. Three samples of Grade A meal were from meals made from freshly killed whales on a factoryship. To prepare these meals, the meat was separated from the bone, coagulated by heating for 4 to 5 minutes at about 90°, pressed, and dried in a rotating oil-fired dryer. Two samples of Grade A - B meal were obtained. The whales were processed 18 to 24 hours after death. One sample was prepared as described above except that coke-fired rotary dryers were used. The Grade B meals were produced by cooking meat and bone for 8 hours at 60 pounds p.s.i. steam pressure, roughly separating the meat and drying in a rotary dryer. The Grade C meals were purely bonemeals.

The following determinations were run on the 7 samples of meals: (1) the albuminoid protein determined by copper precipitation, (2) rate of digestion with pepsin, (3) six members of the B complex, and (4) proximate analyses.

Oil was isolated from each of the samples and analyzed individually. The peroxide values showed a high degree of oxidation, particularly in the two samples graded A - B. The free fatty acid

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 ABSTRACTER: Neva L. Karrick

ENSILING SEAWEED

TOXIC MARINE ALGAE

FISH FOR FUR-BEARING ANIMALS

COMPOSITION OF WHALE MEALS

6.190 (Cross Reference: 1.95)

content of these two samples was also high, suggesting that a considerable period had elapsed between the death of the whale and the production of the meal.

In the meals graded A and A - B a high proportion of the protein was true protein. None of the samples contained high values of ammoniacal nitrogen. This indicated that none of the meal had been prepared from decomposing or bad meat. The results of the protein examination are listed in table 3.

The pepsin digestion tests indicated that the normal whale meats were highly digestible. However, the two containing a large quantity of bone had low digestibility.

The assays for several members of the vitamin B complex indicated a wide variation of the amounts of nicotinic acid, vitamin B_{12}, and inositol. The results of the vitamin assays are listed in table 5.

The analytical data on a whale meal of high-grade quality are listed in table 6.

Table III

Grade	Crude protein, %	Crude protein nitrogen, %	Ammoniacal nitrogen, %	Total protein nitrogen, %	As protein, %	Albuminoid or true protein, %	True protein in total protein, %
A	86·54	13·85	0·04	13·81	86·2	82·40	95·8
A	82·1	13·12	0·10	13·02	81·3	74·20	91·3
A	80·10	12·78	0·06	12·72	79·6	68·80	86·7
A–B	82·83	13·25	0·09	13·14	82·2	79·80	97·2
A–B	84·96	13·60	0·09	13·51	84·5	77·20	91·5
B	56·86	9·10	0·05	9·05	56·6	46·80	84·3
C	18·70	2·99	0·00	2·9	18·1	12·42	68·7

Table V

Grade	Riboflavin, μg./g.	Nicotinic acid, μg./g.	Pantothenic acid, μg./g.	Pyridoxine, μg./g.	Inositol, μg./g.	Vitamin B_{12}, μg./g.
A	4·2	73·5	17·7	—	313	0·02
A	4·5	89·4	3·5	6·6	250	0·07
A	6·4	171·3	4·3	—	201	0·09
A–B	3·2	125·0	7·5	5·0	135	0·09
A–B	3·8	103·7	8·6	—	107	0·11
B	1·6	47·7	3·2	1·2	58	0·07
C	0·4	15·2	1·3	1·0	17	0·01

Table VI

Oil, %	3·0	
Free fatty acids, % on oil	8·0	
Peroxide value of oil	12·0	
Total crude protein, %	80·0	
Ash, %	about 3·0	
True protein in crude protein, %	,, 95	
Rate of protein digestion with pepsin in 16 h. at 40°, %	,, 80	
Riboflavin	above 4·0	μg./g.
Nicotinic acid	,, 80	,,
Inositol	,, 200	,,
Pantothenic acid	,, 10	,,
Vitamin B_{12}	,, 0·07	,,

6. 3

nitrogen at the expense of the protein nitrogen. If L. cloustoni is harvested in the spring when the plant contains inorganic nitrogen, and laminarin is absent, ensiling results in protein synthesis with utilization of the mannitol. If harvested later when inorganic nitrogen is absent, and laminarin is present, ensiling results in the utilization of the laminarin and breakdown of the proteins.

Table VIII

Ensiling experiment with* A. nodosum *collected at South Queensferry 3/12/52*

Sample	pH	Water content	Total ash	Laminarin	Mannitol	Cellulose	Alginic acid	L-Fucose	Wet weed Kjeldahl nitrogen	Wet weed Total nitrogen	Wet weed N.P.N.	Dried milled weed Kjeldahl nitrogen	Dried milled weed Total nitrogen	Dried milled weed N.P.N.
Initial	6·52	73·3	22·3	2·6	8·7	2·4	23·3	6·9	1·76	1·82	0·56	2·00	2·07	0·66
After 48 h. incubation at 30°	5·62	72·9	21·3	2·3	8·5	2·3	—	6·0	1·60	1·50	0·63	2·02	2·08	—
After 67 days' incubation at 30°	5·02	75·2	22·7	1·9	7·5	—	21·2	7·1	1·59	1·69	0·50	1·82	1·93	0·35
After 67 days in pipe	4·78	70·4	21·7	2·8	5·7	—	20·6	8·0	1·86	1·99	0·51	1·84	1·77	0·49
Liquor drained from pipe before emptying	4·76	91·5	44·8	2·9	16·9	—	—	1·8	—	—	—	2·03	2·34	—

* With the exception of the water content the results are expressed as a percentage of the dry matter

Table IX

Ensiling experiment with* L. cloustoni *(whole plant) collected at Feochan 7/1/53*

Sample	pH	Water content	Total ash	Laminarin	Mannitol	Alginic acid	L-Fucose	Wet weed Kjeldahl nitrogen	Wet weed Total nitrogen	Wet weed N.P.N.	Dried milled weed Kjeldahl nitrogen	Dried milled weed Total nitrogen	Dried milled weed N.P.N.	Acetic acid	Wet weed Butyric acid	Lactic acid	Viscosity of 0·25% (w/v) soln. of sodium alginate, cs	Free sugars as glucose
Initial	6·72	82·3	34·8	13·4	13·9	14·2	3·5	1·85	1·76	0·48	1·89	2·02	0·73	—	—	—	13·9	—
After 48 h. incubation at 30°	5·87	82·4	34·8	7·2	12·1	11·4	3·5	1·98	1·90	0·64	1·80	1·87	0·71	—	—	—	—	—
After 60 days' incubation	4·77	84·4	37·5	1·4	2·2	12·6	3·5	2·11	1·96	1·04	2·10	2·24	0·45	—	—	—	—	—
After 60 days in pipe	5·43	81·0	33·3	2·7	8·7	16·2	4·0	1·80	1·73	0·99	1·72	1·88	0·64	0·87	−0·39	2·04	11·5	1·46
Liquor drained from pipe before emptying	5·16	89·3	56·6	nil	16·3	—	2·9	—	—	—	0·98	1·05	—	—	—	—	—	—

* With the exception of the water, acetic, butyric and lactic acid contents, the results are all expressed as a percentage of the dry matter

6. 52

content was variable.

High levels of thiaminase were found in razor belly and moray eel. Since the presence of thiaminase will destroy or inactivate the thiamine present in some fish as well as any thiamine supplied in the fur-animal diet, these species should be culled out if the catch is to be used as a fur-animal feed. However, since thiaminase is destroyed by heat, none would be found in properly processed cat food. No culling would therefore be necessary.

Table I - Data on Shallow-Water-Trawl Fish of Northern Gulf of Mexico Caught in May 1954

Common Name	Scientific Name	Number of Fish in Sample	Weight of Fish (Grams) Minimum	Weight of Fish (Grams) Average	Weight of Fish (Grams) Maximum	Proximate Composition (Percent) Moisture	Protein	Fat	Ash	Thiaminase[1]
Butterfish	Poronotus triacanthus	44	38	54	76	73.4	16.8	8.0	2.7	
Croaker	Micropogon undulatus	33	47	71	91	76.8	15.8	3.2	5.2	Low level
Flatfish	Pleuronectidae spp.	43	30	58	303	76.2	18.4	1.4	4.6	None
Hake	Urophycis spp.	39	20	60	107	80.6	16.2	0.8	3.9	Not tested
Lizardfish	Saurodus foetens	36	41	117	207	77.5	16.6	0.8	3.9	None
Moray eel	Gymnothorax ocellatus	4	140	182	185	79.6	16.6	0.8	3.9	None
Pollefish	Anchoa hepsetus	119	12	15	20	78.1	17.3	1.5	3.1	High level
Scup (porgy)	Stenotomus aculeatus	43	33	56	123	76.6	17.4	2.6	3.9	Not tested
Razor belly	Harengula pensacolae	41	28	53	73	67.8	20.0	7.1	6.4	None
Sea bass	Centropristes ocyurus	11	17	39	63	76.3	17.5	1.5	5.8	High level
Sea catfish	Galeichthys felis	30	57	79	190	72.7	17.4	4.3	5.4	Not tested
Sea robin	Prionotus spp.	35	36	67	207	77.0	18.4	1.2	6.2	None
Sergeant major	Nautopaedium porosissimum	34	14	28	48	81.2	14.6	2.1	2.5	None
Silver eel or cutlassfish	Trichiurus lepturus	45	18	58	82	78.8	16.8	3.6	2.3	Not tested
Snapper (Pensacola red)	Lutianus blackfordi	9	20	32	58	77.4	17.6	1.0	5.4	None
Spadefish	Chaetodipterus faber	3	58	76	100	75.8	18.6	6.2	3.2	Not tested
Spot	Leiostomus xanthurus	27	73	90	112	72.0	18.5	8.3	3.9	None
Squid	Loligo brevis	26	15	41	76	84.0	13.5	1.5	1.0	None
White trout	Cynoscion arenarius	26	77	109	154	79.3	16.4	1.8	3.7	None

1/ The thiaminase assays were made by Food Research Laboratories, Inc., Long Island City, N. Y.

8.0 PROXIMATE CHEMICAL COMPOSITION OF VARIOUS SPECIES OF PHILIPPINE MARKET FISHES

Sulit, Jose I.; Navarro, Olympia B.; San Juan, Regina C.; and Caldito, Elisa B. (Bureau of Fisheries, Manila)
Philippine Journal of Fisheries 2, No. 1, 109-123 (January-June 1953)

The food value of 63 species of fish found in Philippine markets was determined. Whole fish that had been scaled, finned, and dressed were analyzed for moisture, protein, fat, ash, and for the calcium, phosphorus, and potassium of the ash. In addition, calorific values were calculated. Back, belly, tail, and head portions from other whole fish were also analyzed for proximate composition. Other proximate analyses were made to show the extent of variation in composition according to length, depth, and weight of the fish. In most cases, the edible portion and food value were greater in large fishes than in small fishes of the same species. In many instances, the fat content of the belly and head was higher than the fat content of the tail and back, whereas the protein was almost equally distributed in the belly, back, and tail of the fish and quite low in the head of the fish.

 ABSTRACTER: Martin Heerdt

8.51 THE NITROGENOUS EXTRACTIVES FROM FRESH FISH MUSCLE. III. COMPARISON OF SEVERAL FLAT FISHES AND MEMBERS OF THE HERRING-MACKEREL GROUP

Shewan, J. M. (Torry Research Station, Aberdeen, Scotland)
Journal of the Science of Food and Agriculture 6, No. 2, 99-104 (February 1955)

The nitrogenous bases extracted from the muscle tissues of six species of flatfish (lemon sole, plaice, turbot, dab, megrim, and brill) and of four pelagic species (herring, mackerel, Twaite shad, and Ray's bream) were fractionated by displacement chromatography on ion-exchange resins.

The muscle tissue was minced and extracted with alcohol. The bases and amino acids in the ethanol extract, after suitable purification from traces of protein, lipid, mucoids and inorganic salts, were passed through a sulphonated cross-linked polystyrene resin column. The adsorbed substances were displaced with 0.07N sodium hydroxide. Fractions of 3 to 10 ml. were collected. One-dimensional chromatograms were prepared using phenol-3 percent ammonia solution, butanol-acetic acid and phenol-hydrochloric acid as solvents. The chromatograms were treated first with iodine by sublimation, the spots marked, and the paper was then sprayed with the ninhydrin reagent after clearance of the iodine with ammonia vapor. In addition to identification of the nitrogenous bases by their behavior on the chromatograms with the three solvents, further identification was made by the use of certain colorimetric tests, such as the Jaffe (for creatine and creatinine) and the Pauly (histidine, histamine, and carnosine).

In general, the flatfishes all furnish similar displacement pictures. The following compounds were identified in the order of their displacement: glutathione, aspartic acid; threonine, serine, glutamic acid, proline; glycine, alanine, valine; creatinine, histidine, lysine; amines and ammonia.

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 ABSTRACTER: W. N. Sumerwell

7.522 THE FREE AMINO-ACIDS OF FISH. I. TAURINE IN THE SKELETAL MUSCLE OF CODLING (GADUS CALLARIAS)

Jones, N. R. (Torry Research Station, Aberdeen, Scotland)
Journal of the Science of Food and Agriculture 6, No. 1, 3-9 (January 1955)

Codling, either fresh or frozen, were skinned and filleted. Muscle was immediately dissected from the antero-dorsal part of the fillet. An ethanol extract was made from the flesh, and the lipids were removed from the extract with chloroform.

The extract was chromatographed on paper in a two-dimensional system using phenol-ammonia and collidine-lutidine as solvents. In the case of samples which were chromatographed in a one-dimensional system, butanol-acetic acid was used as the solvent.

The papers were air-dried and sprayed with ninhydrin in butanol to stain the chromatogram. The spots were cut out and eluted with aqueous acetone. The content of taurine in the eluate was determined in a photoelectric absorptiometer micro-cell attachment. Readings were made at 570 mμ. Levels of taurine in extracts giving about 10 μg. on the paper could be estimated to ± 7 percent by this method.

Taurine was identified as a major constituent in codling muscle by isolation of the crystalline compound from ethanol extracts of the muscle tissue. The extracts were passed through cross-linked sulphonated-polystyrene resin column to remove basic nitrogenous constituents. The combined effluent and washings from the column were concentrated and then passed through Dowex-2 anion-exchange resin columns. Taurine, which was adsorbed on these columns, was eluted with dilute hydrochloric acid. The eulate was concentrated to dryness and the residue was crystallized from

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 ABSTRACTER: W. N. Sumerwell

7.80 A STUDY OF THE USE OF A SMALL PANEL TO ESTIMATE CONSUMER JUDGMENTS

Prentice, J. H. and Sheppard, D.
Journal of the Science of Food and Agriculture 6, No. 1, 24-29 (January 1955)

Since there are few accepted means of evaluating such qualities as spreadability and firmness in butter, margarine, and cooking fat, several instrument tests of an empirical nature have been developed. Measurements from these instruments were compared with subjective judgments on the same samples. Tests extended over several months. An attempt was made to standardize the panel's judgments by comparing them with those of larger consumer groups made in similar experiments.

In the first experiment, many types of the three materials were tested at various temperatures, and the resulting opinions were based on the following: (1) flavor intensity, (2) flavor quality, (3) spreadability, (4) texture, (5) firmness, and (6) over-all quality. A seven-point scale was used; one point for very good flavor and seven points for a very bad flavor.

Judgments from the small panel and the consumer group were obtained on the same day and compared throughout the experiments. The samples were coded, but the tasters were informed not to judge margarine as a substitute for butter but rather for itself. Temperature and handling procedure remained constant for the two groups, and quality was carefully varied. A group of experts was used as the control panel.

As a result of the first test, the coefficients between the panel scores and the general public scores were significant at the 0.1 percent level for flavor quality and spreadability, the 2 percent

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 ABSTRACTER: Lois Elgin

COMPOSITION OF PHILIPPINE FISH

TAURINE IN COD MUSCLE

NITROGENOUS EXTRACTIVES FROM FISH

USE OF SMALL TEST PANEL

7.522 (Cross References: 8.51, 1.5)

aqueous ethanol. The crystalline product was identified as taurine.

Fresh codling from a single batch of fish have relatively constant muscle taurine levels. Considerable variation was found between batches.

During storage in ice, codling lose a considerable amount of muscle taurine by leaching. The loss of taurine in this manner parallels that of non-protein nitrogen.

7.80

level for firmness, and the 5 percent level for flavor intensity. The panel and the consumers did not agree on texture or over-all quality.

In the second experiment, only a few types of two materials were studied to find what changes occurred during storage. The individual panel members' judgments were compared for self consistency over a period of time.

These experiments illustrated that if a panel is carefully chosen, it can be a reliable guide to estimating consumer opinion. The degree of accuracy would depend on the characteristic being judged.

8.51 (Cross References: 7.522, 7.593, 7.81)

Several unidentified components also were observed.

The pelagic fishes gave displacement diagrams distinct from any species so far investigated, and from each other. The main feature of the group is the preponderance of basic amino acids, especially histidine.

The presence of large amounts of basic amino acids, and in particular of histidine, in the herring-mackerel-tunny group is of importance. The characteristic meaty flavor of the group is said to be due to these compounds. Also, the success of the proposed histamine test as an index of freshness in these species depends on the presence in the fresh fish of large amounts of free histidine, which apparently can easily be decarboxylated, either by tissue enzymes or more likely by bacteria, to histamine.

To show that histamine is readily formed, mackerel were allowed to spoil in ice for 8 days. The free bases and amino acids were investigated by the ión-exchange and paper-chromatography procedures. The results show that large amounts of histamine were present in the spoiled flesh; in contrast to the results from fresh mackerel which showed no detectable histamine.

2.118 JAPANESE HIGH-SEAS MOTHERSHIP-TYPE DRIFT GILL-NET SALMON FISHERY -- 1954

Fukuhara, Francis M. (U. S. Fish and Wildlife Service, Seattle, Washington)
Commercial Fisheries Review 17, No. 3, 1-12 (March 1955)

The author, a fishery research biologist with the U. S. Fish and Wildlife Service, accompanied the Japanese fleet engaged in salmon fishing in northwestern Pacific waters as an observer during the 1954 season. Data were obtained concerning motherships and their facilities, catcher boats, gear, methods, hydrographic conditions, and fishing results.

From May 15 to August 24, 1954 seven motherships (six with refrigeration capacity and three with canning facilities), 160 catcher boats, and 36 scout boats operated from 3 to 300 miles offshore in the area between 175° E. longitude and the east coast of Kamchatka Peninsula, south and west of the Aleutian Islands.

Each catcher and scout boat fished from 7,000 to 8,500 fathoms of 4.8-inch to 5.0-inch mesh gill nets per set. Nets on catcher boats were hauled entirely by hand, while aboard scout boats hauling was aided by taking in the lead line on a line hauler. Catcher boats, because of their limited capacities, were confined to a radius of 50 miles from the motherships. Scout boats, however, were equipped to range further and were used to explore for the most promising fishing areas.

Specific fishing positions were chosen by locating areas where currents converged. Therefore, frequent determinations of water conditions (temperature, transparency, and color) were made by the catcher and scout boats. Places where these features changed rapidly indicated a confluence of currents. All hydrographic information, as well as operational progress details, was relayed

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 ABSTRACTER: M. R. Greenwood

2.114 COSTS OF METAL UNIT PEN FISH HOLDS

MacCallum, W. A.
Fisheries Research Board of Canada, Progress Reports of the Atlantic Coast Stations, No. 61, 13-21 (March 1955)

High capital costs have been a major obstruction throughout the development of insulated, refrigerated metal-fish holds since their beginning in 1946. However, the development work has shown that if metals are used in the construction of fish pens spoilage is reduced, whereas wood construction encourages spoilage.

Metal surfaces do not harbor bacteria and may be readily brushed and rinsed nearly free from contamination. In contrast, the bacterial population of slime-soaked wood boards is changed very little either by washing or by the use of disinfectants. Washed wood boards may be so heavily contaminated that fish stowed against them for as little as 4 days become unfit for market. Wood boards in this condition require banking with ice or the use of a thin wall of ice behind metal screens to keep the fish away from the boards. An average of at least 9 tons of extra ice are required to keep the fish away from the boards in an insulated, refrigerated wood-lined fish hold over and above the ice requirements of an insulated, refrigerated metal-lined fish hold. If 30 trips are made each year the saving in ice at a cost of $4.00 per ton will amount to $1,080.00.

Metal has been used in the construction of the unit fish pens aboard the trawler Cape Argos. These pens satisfy the technological, engineering, and fishermen's requirements for the design of fish pens for the bulk storage of iced fish. The cost of the metal fish hold is available for comparison with the capital costs and maintenance costs of the wood-lined fish hold. With these data it is possible to make an economic study of the two types of fish holds.

(over)

 ABSTRACTER: Martin Heerdt

3.5 CHANGES IN DUTCH SALTED MATJESHERRING DURING STORAGE AND SPOILAGE

Luijpen, A. F. M. G. (Centraal Instituut voor Voeingsonderzoek T.N.O., Utrecht)
Symposium on Cured and Frozen Fish Techology, Swedish Institute for Food Preservation Research, Goteborg, No. 100, Chapter 4 (November 1953)

Experimental. -- Six lots of good quality ripe matjesherring were leached in water at room temperature for different periods, none of which exceeded 24 hours, to a salt content of 4.8 to 13.5 percent. The fat and protein content of these herring averaged about 14 percent and 13 percent, respectively. The herring in each of the lots were then cleaned, cut into pieces, sealed in cans in brine of a strength suited to the salt content of the respective lots, and stored at -5°, -2°, 0°, and 2° C. After regular intervals of time, the cans were cut open and the herring examined.

Each of the brines was examined to determine the number of aerobic and anaerobic microorganisms which would grow at 24° C. The predominant aerobic microorganisms which grew at 24° C. were then identified.

Each of the herring samples was examined for (1) pH with the glass electrode, (2) acid number of the fat by titration in a mixture of ethyl-alcohol and chloroform after extraction with chloroform, (3) fat peroxide by the method of Lea, (4) non-specific tyrosine by a color method with the reagent of Folin and Ciocalteu, (5) ammonia and trimethylamine by microdiffusion in Conway dishes, and (6) volatile acids by the Friedemann method.

Results. -- The bacteria counts and predominant microorganisms did not show any correlation with the degree of spoilage, the storage temperatures, or the salt concentration. Aerobic bacteria were

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 ABSTRACTER: Martin Heerdt

1.017 TUNA FACTS AND PROSPECTS

Kearns, F. J. (Commonwealth Fisheries Office, Sydney, Australia)
Fisheries Newsletter 14, No. 2, 11, 13, 23 (February 1955)

Although Australia's young tuna industry has been suffering from growing pains, the outlook for Australian tuna is good. By developing all potential markets to the fullest extent, the industry can grow large enough to operate economically and retain profit margins at world price levels.

Both raw and canned tuna are world trade commodities. Tuna is the first Australian fish product to attain that status and is the only one at present that can potentially match imported fish in quality and price. Tuna also appear to be the only species which can provide the mainstay of a strong Australian fish-canning industry.

Domestic market. -- The potential markets for Australian tuna require careful study. The aim for the domestic market should be to establish tuna as a standard grocery article rather than as a specialty item.

United Kingdom. -- Although the United Kingdom is a potential outlet for large quantities of tuna, many factors operate to make that demand variable. The present foothold in that market needs to be consolidated and a continuous demand for Australian tuna developed.

Other countries which are potential markets for Australian tuna include New Zealand, South Africa, possibly parts of Southeast Asia, and possibly the United States -- already an established outlet for raw tuna.

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 ABSTRACTER: Kathryn L. Osterhaug

MOTHERSHIP FISHING OPERATIONS

STORAGE CHANGES IN SALT HERRING

COST OF METAL VS. WOOD FISH PENS

AUSTRALIAN TUNA INDUSTRY

3.5

present in numbers ranging from 10^3 to 10^4/gram, but these declined after about 100 days to 10^2/gram. Differentiation of the microorganisms was carried out 7 times during the period of storage. The micrococci that were predominant represented respectively, 50, 60, 70, 75, 80, and 90 percent of the total microorganisms.

The pH values were correlated to some degree with the salt content, and did not appear to change significantly during storage. After desalting, the percent salt and the corresponding pH ranges were respectively, 13.5 percent and pH 5.7 to 5.9; 12.0 percent and pH 5.9 to 6.1; 9.4 percent and pH 6.0 to 6.2; and 4.8 to 8.1 percent and pH 6.0 to 6.3.

No relationship was found to exist between the acid number of the fat and the time and temperature in storage. The fat from herring with the highest salt content (13.5 percent salt) had an acid number of 16.4 to 34.6 milligrams potassium hydroxide per gram of fat, whereas the fat from desalted herring (less than 13.5 percent salt) had an acid number of 9.8 to 18.6 milligrams potassium hydroxide per gram of fat. This change occurred during desalting.

The peroxide numbers of the starting material varied from 1.3 to 13.0 equivalents of thiosulfate per kilogram of fat, but during storage these values usually declined to 0. Tyrosine values were correlated with the salt content, storage time, and storage temperature. A high storage temperature and/or reduction of the salt content stimulated the formation of tyrosine. Ammonia formation was more sensitive to temperature than tyrosine formation, however the values parelleled one another. Trimethylamine formation was favored by high temperatures and was less strongly inhibited by salt concentration than was tyrosine or ammonia. Volatile acid formation appeared to depend markedly upon temperature and salt content.

Organoleptic changes followed a definite pattern. Spoilage in the very lightly salted herring started with a sweet odor and a bitter taste after which the herring became putrid. Spoilage in herring having more salt was preceeded by a ripening process that yielded an anchovy-like flavor and then a cheesy flavor after which putrefaction set in. Marked rancidity was never observed.

1.017 (Cross Reference: 1.1)

World Production of Canned Fish, 1951

	million lb.
Herrings, Sardines, Anchovies and similar	638.1
Pacific Salmon	327.7
Tunas, true mackerels and similar	320.2
Other species	90.4
	1276.4

Australian Production of Canned Fish

	('000 lb.) 1952/53	1953/54
Australian Salmon	4,005	4,827
Barracouta	2,673	923
Other	1,027	849
	7,705	6,599

Australian Imports of Canned Fish, 1953-54

	('000 lb)
Herrings	6,863
Sardines	4,575
Salmon	3,061
Pilchards	94
Others	387
	14,980

Total value of imports was £2,207,000.

Australian Production of Tuna

	lb. (round weight)
1949-50 ..	807,839
1950-51 ..	40,859*
1951-52 ..	214,008
1952-53 ..	688,446
1953-54 ..	1,273,801
1954-55 ..	1,400,000*

(to 17/12/54)

* New South Wales production only.

2.118 (Cross References: 2.1126, 1.30)

regularly to the motherships where it was recorded and used for planning subsequent fishing operations.

All salmon caught were identified as to species, and samples of each species were weighed daily to determine the average size of the fish landed each day. A total of 20,468,148 salmon was taken in the 1954 operation -- a little more than twice as many as were taken during the two previous seasons. The increased catch might be accounted for by the fact that in 1954 twice as many boats fished about four times as much gear as was the average of the two previous years, and that "Amilon" (similar to nylon) webbing was used in place of the less efficient "rami" (China grass) webbing used previously.

Chum salmon were most frequently taken with 9,375,620 being caught during the season, while the other four species were taken in the following amounts: pink, 5,802,196; red, 3,817,159; silver, 1,398,066; and king, 75, 107. The average catch of all species per unit of effort was 5.65 fish per "tan" (28.3 fathoms).

2.114

The approximate fish hold dimensions are 25 x 31 x 12 feet in depth under the hatches. The hold is divided into 8 pens on each side. In addition, there are 8 pens in the run or central part of the fish hold.

The cost of wood construction installed in the fish hold was $7,125.90. The uniform annual end-of-year payment necessary to repay the investment in 15 years at 5 percent interest was $686.51. The annual maintenance, replacement, and insurance charges were $873.10. The annual cost of a fish hold of wood construction therefore was $1,559.61. The yearly ice consumption over and above that required in a metal fish hold because of a need for shielding the fish from the wood was 9 tons of ice per trip at $4.00 per ton for a total of 30 trips or $1,080. The total annual cost of a fish room of wood construction, including the costs of extra ice to render it as suitable for the storage of iced fish as a metal hold, was $2,639.61.

The cost of aluminum alloy unit pen construction installed in the fish hold with minimum use of movable metal boards was $18,376.90. The uniform annual end-of-year payment necessary to repay the investment in 15 years at 5 percent interest was $1,770.43. Annual maintenance, replacement, and insurance charges were $918.92. The total annual cost of a fish room of metal construction was $2,689.35.

The annual cost of the wood-lined fish hold was about $50 less than the cost of the metal-lined fish hold with a minimum of metal boards and about $60 less than the cost of the metal-lined fish hold with a maximum of metal boards. The capitalized cost was $2,565 higher when a maximum of metal boards was provided.

Experience with aluminum alloys suggests that the unit pen may have a life beyond the 15 years estimated for capital recovery. The greater ease in washing and the reduction in labor at sea that results from the handling of less ice are difficult to evaluate.

3.17 FURTHER OBSERVATIONS ON THE DISTRIBUTION OF CHLOROTETRACYCLINE THROUGHOUT ICE BLOCKS

Boyd, J. W.; Bissett, H. M.; Tarr, H. L. A. (Pacific Fisheries Experimental Station)
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 102, 14-15 (March 1955)

It was shown earlier that the addition of carrageen to the water used in making ice containing 1 p.p.m. of chlorotetracycline (aureomycin or "CTC") caused this antibiotic to become fairly uniformly distributed throughout ice blocks. In the early work, heat was necessary to dissolve the carrageen, which introduced complications. Further work showed that solution can be effected by prior mixing of the dry carrageen with propylene glycol, and that distribution of the antibiotic can be effected by use of carboxymethyl cellulose (CMC).

Procedure. -- (1) The dry powdered carrageen is mixed with 2 parts of propylene glycol, and after a short time, cold water is added to give a 5-percent solution of carrageen. (2) Since CMC tends to form lumps if added to cold water directly, the particles are distributed by mixing them with salt before adding water.

Results. -- The blocks of ice were sawn into sections as indicated in diagrams A and B. The accompanying table shows that, with water alone, CTC tends to freeze into a core toward the bottom of the block, whereas with the carrageen-propylene glycol, or CMC-salt methods, a reasonably uniform distribution of the antibiotic is obtained.

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 ABSTRACTER: F. Bruce Sanford

3.237 FISH-STICK OUTPUT HIGH IN 1954

Anonymous
Commercial Fisheries Review 17, No. 3, 28-29 (March 1955)

The total U. S. fish-stick production for 1954 was 50.1 million pounds in comparison to 7.5 million pounds in 1953. (See accompanying table)

Retailers derived a gross income of $40 million in 1954 from this production.

In October 1954, monthly fish-stick production reached a high of 5.6 million pounds as compared with 1.4 million pounds in 1953.

Fish sticks are uniform pieces of fish dipped in batter, breaded, and frozen. They may be deep-fat fried and then frozen (cooked sticks), or they may be frozen immediately after breading (uncooked sticks). Cooked sticks, which have been deep-fat fried before freezing, are oven heated by the consumer for serving. Uncooked sticks are intended for housewives and chefs who prefer to do the frying themselves.

Cod (mostly imported) is the principal species used. Haddock, ocean perch, and a few others are also used.

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 ABSTRACTER: Max Patashnik

3.26 NEED FOR TRAINING FROZEN FOOD SPECIALISTS

Schauffer, Harry K. (National Wholesale Frozen Food Distributors Association)
Southern Fisherman XV, No. 3, 33, 35 (March 1955)

The frozen-food industry in the United States is already bigger dollar-wise and is growing faster than all commercial aviation. Because of this rapid growth, it is difficult for many retailers to keep pace with the new developments and constantly increasing problems.

The possibilities in the frozen-food field are almost unlimited, but to take advantage of opportunities offered by freezing it is necessary to be aware of the serious hazards to quality peculiar to frozen foods. "If top quality is the greatest stimulus in frozen food progress, every threat to that quality deserves honest appraisal." Carelessness in handling frozen foods is to be roundly condemned.

The best approach to solving the problems of frozen-food distribution is the proper training of frozen-food specialists. A course of training based on learning by doing is suggested. In the training course, each of the following fields would be covered: production, office operations, order picking, fork-lift operation, driving, advance selling, stock handling, retail selling, and store layout.

A training program such as the one outlined above would not only be a fine thing for the employee, but would give his employer a definite advantage over competitors whose employees did not have this specialized training.

 ABSTRACTER: Kathryn L. Osterhaug

3.249 DETERMINATION OF COOK DRIP IN PACIFIC OCEAN PERCH (SEBASTODES ALUTUS) AND PACIFIC OYSTERS (OSTREA GIGAS) BY USE OF A NEW METHOD

Sumerwell, William N. (Fishery Technological Laboratory, Seattle, Washington)
Commercial Fisheries Review 17, No. 3, 18-21 (March 1955)

A method for determination of the amount of drip forming when frozen fish is thawed and cooked was developed. The fish in the form of fillets cut crosswise into pieces about one-inch long are weighed onto small wire racks made of 1/2-inch mesh screen placed in the bottom of half-pound flat cans. When oysters are used, two or three (depending upon the size) whole oysters are weighed and placed upon the screens. Lids containing a 1 3/8-inch hole cut in them are seamed onto the cans and a number eight 2-hole rubber stopper fitted into the hole in the lid. A thermometer extends through one of the holes and an 8-inch length of glass tubing through the other to prevent evaporative losses and maintain atmospheric pressure during cooking. The fish are then frozen in the cans if drip on the frozen product is to be determined. For cook-drip determination, the weight of can and contents is determined, and the cans are then immersed in boiling water until the sample reaches a temperature of 150° F. The can is cooled in water, opened, and the drip poured off.. The weight of the can and contents is then again determined, the loss representing drip. Averages of six replicate samples are used for calculating the percentage of drip in any particular lone sample. The precision of the method is indicated by the data in table 1.

On Pacific oysters held in storage at 34° F., cook drip rose from 10.3 percent for freshly shucked oysters to 23.7 percent after storage for 26 days. In another series, oysters having an initial cook drip of 22.1 percent showed no significant rise in cook drip when frozen and stored for 4 weeks at 0° F.

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 ABSTRACTER: M. E. Stansby

DISTRIBUTING AUREOMYCIN IN ICE

HANDLING FROZEN FOOD

1954 FISH-STICK OUTPUT

COOK DRIP IN FISH AND OYSTERS

3.26 (Cross Reference: 9.7)

3.249 (Cross References: 8.43, 0.37, 2.4, 3.329, 1.81, 1.4)

Table 1 - Comparison of the Amounts of Cook Drip from Samples of Frozen Rockfish Fillets Cooked Without Being Prethawed and Cooked After Being Thawed

Sample	Drip from Fillets Cooked Without Being Prethawed	Sample	Drip from Fillets Cooked After Being Prethawed 1/
Number	Percent	Number	Percent
1	29.7	7	25.5
2	30.9	8	25.9
3	33.7	9	25.3
4	29.9	10	25.1
5	29.7	11	25.4
6	30.5	12	25.2
Mean Value	30.7	Mean Value	25.4
Standard Deviation	1.4	Standard Deviation	0.3

1/ The fillets did not yield a measurable amount of thaw drip.

3.17

Distribution of CTC (Aureomycin) in ice frozen with various additives.

Composition of solution frozen, (%)	CTC in p.p.m. in sections cut as in diagram A					
	1	2	3	4	5	6
Water alone	0.36	0	0	0.92	0.34	0
Carrageen 0.005	0.56	0.6	0.44	1.00	1.36	1.24
CMC 0.005 + salt 0.04	0.46	0.54	0.52	0.86	1.12	1.04
CMC 0.01 + salt 0.04	0.62	0.52	0.54	0.78	0.96	0.80

	CTC in p.p.m. in sections cut as in diagram B			
	1	2	3	4
Water alone	0	0	0.72	0.40
Carrageen 0.005	0.56	0.30	0.66	1.28
CMC 0.005 + salt 0.04	0.44	—	0.80	0.88
CMC 0.01 + salt 0.04	0.56	0.24	0.52	0.92

A

1	2	3
4	5	6

B

	2	
1	3	1
	4	

3.237

U. S. Fish-Stick Production, 1954 and 1953

Month	1954			1953
	Cooked	Uncooked	Total	Total Cooked and Uncooked
	(Pounds)			
January	2,433,500	337,100	2,770,600	115,000
February	2,856,400	323,200	3,179,600	133,000
March	3,561,700	441,800	4,003,500	148,000
April	3,361,900	452,600	3,814,500	34,900
May	3,467,000	447,700	3,914,700	21,800
June	4,084,100	363,200	4,447,300	30,800
July	3,464,500	411,200	3,875,700	416,600
August	4,003,200	400,100	4,403,300	454,400
September	3,801,200	509,900	4,311,100	809,500
October	4,736,400	882,200	5,618,600	1,434,900
November	3,969,700	824,200	4,793,900	1,901,800
December	4,201,900	753,400	4,955,300	2,001,200
Total	43,941,500	6,146,800	50,088,100	7,501,300

1.0112 PACIFIC OCEANIC FISHERIES INSTITUTE

Anonymous
Pan American Fisherman 9, No. 11, 12-13, 20 (June 1955)

The Pacific Oceanic Fisheries Institute completed six vessel cruises during the months of January through March 1955. Two trips to the north were made to investigate the winter oceanography and occurrence of albacore north of Hawaii. A cruise to equatorial waters was made to test improvements in long-line gear. Two cruises studied phases of the Hawaiian skipjack, and another cruise investigated the distribution of yellowfin stocks near the Line Islands.

The staff of POFI, in cooperation with coastal research agencies, has completed plans for two oceanographic cruises scheduled for this summer and fall. The first will cruise across the North Pacific from Japan to the Pacific shores of North America to gather data on current systems. The second joint cruise is planned to provide information on the region between the central equatorial Pacific and Central America.

The hydrographic information, salinity titrations, temperature corrections, and calculations of thermometric depths information gathered on the North Pacific cruise are being processed and analyzed. Particular emphasis will be placed on the fluctuations of the trade wind system and the observed fluctuations of such factors as current speed and intensity of upwelling.

As determined by long-line fishing, the greatest concentration of yellowfin occurs near the area of greatest zooplankton abundance. The high and low periods of concentration of yellowfin and zooplankton are also related.

(over)

 ABSTRACTER: Lois Elgin

4.64 PREPARATION AND EVALUATION OF TWO NEW FAT-SOLUBLE METAL INACTIVATORS

Schwab, A. W. and Evans, C. D. (U. S. Department of Agriculture, Peoria, Illinois)
Journal of Agriculture and Food Chemistry 3, No. 6, 518-520 (June 1955)

Two new fat-soluble metal inactivators have been prepared and evaluated for the stabilization of vegetable oils. One of the compounds, a mono-octadecyl ester of (carboxymethylmercapto)-succinic acid, is of the tridentate type, having two carboxy groups in either α or β positions to the coordinating sulfur atom. The other, a mono-octadecyl ester of thiodisuccinic acid, belongs to the tetradentate class. Both compounds have the essential structure for effective chelation of metals.

Soybean oil is subject to deterioration by catalytic effects of prooxidant metals, such as iron and copper. A number of compounds, known as metal inactivators, have been and are being added to the edible oils to destroy the catalytic effects of these metals. At present the edible-oil industry lacks a metal-chelating agent that (1) is nontoxic, (2) does not impart an undesirable odor, flavor, or color, (3) is heat-stable, (4) readily available, and (5) oil-soluble. The present investigation was undertaken in an effort to develop a fat-soluble metal inactivator more effective and satisfactory than any previously described.

Sulfur compounds of the tridentate class having two carboxy groups in either α or β positions to the coordinating atom have been found very effective in stabilizing vegetable oils. Recently (carboxymethylmercapto)-succinic acid has been shown to possess high activity for this purpose, although the molecule has one more carboxy group than is necessary for complexing the iron. In the pentadentate class, thiodisuccinic acid has been prepared and also found to be an effective metal inactivator, but in this case, the molecule has two more carboxy groups than are necessary for complexing the iron.

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 ABSTRACTER: Alan Beggs

1.86 3,000 LIVE KING CRAB HIT SEATTLE ABOARD "TOTEM"

Anonymous
Fishermen's News 11, No. 11, 1 (June 7, 1955)

More than 3,000 live king crabs arrived in Seattle last week aboard the trawler "Totem." This was the first commercial venture of its kind. The crab (25,000 pounds) were taken by Captain Kaare Kaldestad and crew off the Shumagin Islands in 1 1/2 days of fishing. They arrived in Seattle just 6 1/2 days later, and were kept alive in transit in the same manner as similar shipments of dungeness crab from the vicinity of Ketchikan. Only a small percentage of the crab were dead on arrival in Seattle.

Some of the crab were processed immediately in Seattle, while others were held over in a live tank. While most of the crab went to Seattle consumers, marketing of the remainder was comparatively simple in view of the excellent and complete coverage provided by the daily press, radio, and two television stations.

Captain Kaldestad hopes to continue to deliver live king crab to Seattle and feels that if the loss factor is slight the venture will be economical.

 ABSTRACTER: Martin Heerdt

2.118 BRITISH TRAWLER QUICK FREEZES EARLY PART OF CATCH

Anonymous
Canadian Fisherman 42, No. 6, 15-17 (June 1955)

The British are experimenting with a plan to freeze the first fourth of a trawler's catch. The fish will be quick frozen after gutting and washing and then stored at a low temperature. The rest of the fish will be stored in ice as usual. To freeze continuously at the rate of catching would require a freezing unit three times as large as the unit planned for this operation. It is hoped that the quality of the fish will be improved, and that the vessel will be able to stay out on the fishing grounds longer and return with a larger catch.

The experiment was launched when the Northern Wave sailed from England recently for fishing grounds off Iceland. She was fitted with a special freezing plant in the forward part of the fish hold. In this type of freezer the fish are placed between vertical metal plates refrigerated at -35° F. and are frozen into slabs about 36 x 18 x 4 1/2 inches weighing 60 pounds. When the fish have reached a temperature of below 0° C. in about 5 hours' time, the slabs are released by moving the plates apart while the metal is warmed by hot refrigerant gas. Levers control the opening and closing of the plates and the switching from the cold to hot refrigerant. The ship's freezer has 16 units loaded in rotation with each unit producing three slabs at a time. Problems which arose during the design of the unit included (1) preventing the drying out of the fish, (2) the small area available, and (3) providing the doors with handles that would be safe during a heavy sea.

After thawing it will be possible to market and sell the fish in all the usual forms, including smoked fish. The quality at time of freezing can be preserved for several months but special care is needed at all stages of handling.

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 ABSTRACTER: Lois Elgin

1.86 (Cross Reference: 2.6)

2.118

If this experiment is successful it should be of great interest to the Canadian and American fishing industries. It has been estimated that fishing boats returning from trips to the Grand Banks area utilize, on the average, little more than half their fish hold capacity. This has been due to a combination of poor fishing and the need to safeguard the early part of the catch. The Northern Wave experiment will prove whether the idea of freezing the early part of the catch is economical.

1.0112 (Cross References: 1.10, 9.11)

The abundance of yellowfin may be related to changes in the ocean environment which in turn is determined by changes in the wind structure. Catch rate is closely associated with water temperature; relatively cold water yields a poor catch while warm waters bring good fishing.

In the Hawaiian fishery, the male yellowfins attain greater size than the females. The sex ratio is 60 percent males to 40 percent females. The smaller fishes (110-120 pounds) enter in June and July, while the larger fishes (180-220 pounds) come in August and September. Growth rates are believed to be similar in the areas studied.

Yellowfin data show no relationship between the size of parts and fork lengths of the fish. Analysis has also shown that the body proportions are so different there could be little intermingling of yellowfin from the eastern and western Pacific.

Tuna larvae of the yellowfin, skipjack, bonito, and frigate mackerel species were found in the central Pacific. Spawning by tuna apparently extends continuously over a broad section of the central equatorial Pacific.

The study on spearfishes shows a marked variation in character and growth. Six species are recognized: (1) the swordfish, (2) the short-nosed spearfish, (3) the sailfish, (4) the black marlin, (5) the striped marlin, and (6) the blue marlin. All species are carnivorous and are widely distributed in the Pacific with different centers of abundance.

Recent modifications in long-line gear included a change from the standard six-hook basket to the standard 11-hook basket. Steel cable long-line fishing gear is also being tested. Although there are a number of flaws in the steel gear, its possibilites are being investigated.

(This article was prepared from the January-March 1955 report of the Pacific Oceanic Fishery Investigations, Fish and Wildlife Service.)

4.64

With these extra groups, it seemed possible to esterify the molecules with a long-chain fatty alcohol -- thereby imparting solubility in oil to the molecules.

The mono-octadecyl ester of (carboxymethylmercapto)-succinic acid was prepared by heating under reflux for 5 hours 0.05 moles each of octadecyl potassium maleate and mercaptoacetic acid along with 100 milliliters of ethyl alcohol. After standing at room temperature for several hours, a white solid separated from the mixture and was collected on a sintered-glass funnel. After acidification with dilute HCl and several washings with cold water, the final product was dried in a vacuum dessicator over NaOH.

The mono-octadecyl ester of thiodisuccinic acid was prepared by heating under reflux for 3 hours 0.05 moles each of octadecyl potassium maleate and mercaptosuccinic acid along with 100 milliliters of ethyl alcohol. The ethyl alcohol was then removed by distillation, leaving a white residue, which was acidified with 125 milliliters of dilute HCl and extracted with diethyl ether. The ether was removed by distillation, leaving a white waxy residue, which was then recrystallized from ethyl alcohol for purification.

The evaluation of the metal inactivators showed that their use was limited to addition to the cooling phase (below 100° C.) of the deodorization of vegetable oils. They were found to be soluble to the extent of approximately 2 percent at 60° C. in the edible oils, and their addition showed a marked improvement in the oil's stability. The inactivators showed no reduction in the initial flavor of the vegetable oil and a significant improvement in the organoleptic flavor scores after aging as compared with the control sample.

0.117 A SIMPLE APPARATUS FOR FREEZE-DRYING OF ANIMAL TISSUES

Eranko, Olavi
Acta Pathol. Microbiol. Scand. 35, 426-32 (1952)
Chemical Abstracts 49, No. 5, 3298 (1955)

A simple and inexpensive freeze-drying app. is described. It consists of an inner glass tube connected by a standard ground joint to an outer tube and of a 2-stage mech. pump for evacuating the space between the 2 tubes. The design is based on the principle of short-path condensation. Diethyl oxalate and solid CO_2 are used to produce a const. tissue temp. of -40°. The trap wall is cooled either with liquid air or a mixt. of solid CO_2 and alc. or acetone. Freshly cut sections can be dried with the app. in less than 1 hr. and small tissue pieces in 1-2 days.

0.117 MOLECULAR DISTILLATION AND ITS IMPORTANCE TO THE FOOD CHEMISTRY AND FOOD INDUSTRY

Acker, L.
Z. Lebensm. -Untersuch. u. -Forsch. 89, 518-28 (1949)
Chemical Abstracts 44, No. 2, 763 (1950)

The methods, app., and uses of mol. distn. are reviewed. Twenty-six references are listed.

0.117 PREPARATION OF REDISTILLED WATER IN A NEW APPARATUS

Schindera, E. and Vetter, H.
Suddeut. Apoth. -Ztg. 90, 509-510 (1950)
Chemical Abstracts 44, No. 20, 9193 (1950)

0.118 UNIQUE SALT TESTER SIMPLIFIES QUALITY CONTROL

De Alcuaz, Luis
Food Engineering 27, No. 4, 86 (April 1955)

An inexpensive salt meter that operates on a conductivity principle to detect salt concentrations down to 0.05%, with a precision of 0.05% in 30 seconds, eliminates the former time-consuming titrations and organoleptic techniques.

0.118 INTERNAL VACUUM IN CANS

Kefford, J. F.
Food Preservation Quarterly 14, No. 1, 8-18 (March 1954)

(Abstract of this article appears under 3.33 page 13 - January 1955)

0.118 MEASURES SOLUTION VISCOSITIES FROM 0 TO 100,000 CP BY ULTRASONICS

Anonymous
Food Processing 16, No. 4, 68 (April 1955)

0.32 COMPARATIVE PROTEIN CHEMISTRY: THE COMPOSITION OF THE PROTEINS OF HUMAN TEETH AND FISH SCALES

Block, Richard J.; Horwitt, M. K.; and Bolling, Doris
J. Dental Research 28, 518-24 (1949)
Chemical Abstracts 44, No. 2, 675 (1950)

Herring scales contain gelatin and a collagen-like protein, ichthylepidin. Twenty-five references.

0.32 LIGHT ABSORPTION BY PROTEINS. I.

Schauenstein, E.
Monatsh. 80, 820-55 (1949)
Chemical Abstracts 44, No. 19, 8978 (1950)

II. Absorption of polarized ultraviolet light; Tyndall scattering in the ultraviolet.

0.32 COMPARATIVE STUDY OF THE MYOSINS OF FISH AND RABBIT

Hamoir, G.
Bull. soc. chim. biol. 31, 118-122 (1949)
Chemical Abstracts 43, No. 21, 8485 (1949)

Skeletal muscles of carp yield α- and β-myosins very similar in properties to the myosins of rabbit muscle. Factors influencing the extractability of carp myosins are discussed.

0.5 BACTERIOLOGICAL STUDIES ON CANNED CRAB

Tanikawa, Eiichi; Nishimura, Seigo; Nenohi, Mamoru; and Tezuka, Issei
Bulletin of the Faculty of Fisheries, Hokkaido University 5, No. 2, 183-208 (August 1954)

II. Bacteriological studies on the swelling of canned crab (Paralithodes camtschatica)

The isolated bacteria were similar to Bac. mesentericus vulgatus. The cause of the swelling was assumed to be the heat resistant spores.

III. Bacteriological studies on the swelling of canned crab (3) (Erimacrus isenbeckii)

Of the isolated bacteria, one is similar to Bac. megatherium and the other is similar to Bac. mesentericus vulgatus.

IV. The relation between the degree of sterilization and the concentration of the bacterial spore suspension which was isolated from "swelled canned crab"

0.5 EXPERIMENTAL VIEWPOINTS ON ROPINESS OF FISH BRINE

Lindeberg, Gosta
Symposium on cured and frozen fish technology, Swedish Institute for Food Preservation Research, Goteborg, No. 100, Chapter 13 (November 1953)

(Abstract of this article appears under 3.5 page 7)

1.2 STUDIES ON THE SALT CONCENTRATION OF COMMERCIALLY DRIED (TUYO) AND SMOKED (TINAPA) HERRING

Uyenco, V.; Rodriguez, P.; and Taruc, R.
Philippine Journal of Fisheries 2, No. 1, 85-91 (January-June 1953)

(Abstract of this article appears under 3.5 page 7)

1.2 EXPERIMENTAL VIEWPOINTS ON ROPINESS OF FISH BRINE

Lindeberg, Gosta
Symposium on cured and frozen fish technology, Swedish Institute for Food Preservation Research, Goteborg, No. 100, Chapter 13 (November 1953)

(Abstract of this article appears under 3.5 page 7)

1.2 MID-WATER TRAWL EXPERIMENTS

Anonymous
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 102, 19 (March 1955)

(Abstract of this article appears under 2.1121 page 5)

1.30 JAPANESE HIGH-SEAS MOTHERSHIP-TYPE DRIFT GILL NET SALMON FISHERY -- 1954

Fukuhara, Francis M.
Commercial Fisheries Review 17, No. 3, 1-12 (March 1955)

(Abstract of this article appears under 2.118 page 15)

1.30 PACIFIC SALMON RESEARCH EMERGES ON AN OCEANIC SCALE

Anonymous
Pacific Fisherman 52, No. 13, 9-14 (December 1954)

(Abstract of this article appears under 9.4 page 11 - February 1955 issue)

1.30 OBSERVATION OF JAPANESE HIGH-SEAS SALMON GILL-NET FISHERY OFF HOKKAIDO

Atkinson, C. E.
Commercial Fisheries Review 16, No. 10, 17-19 (October 1954)

(Abstract of this article appears under 2.14 page 19 - January 1955 issue)

1.5 ELECTROPHORETIC STUDIES OF PROTEINS EXTRACTABLE FROM POST-RIGOR COD AT LOW IONIC STRENGTH

Dingle, J. R.; Eagles, D. E.; and Neelin, J. M.
Journal of the Fisheries Board of Canada 12, No. 1, 75-84 (January 1955)

(Abstract of this article appears under 0.32 page 1)

1.5 THE ALKALINE HYDROLYSIS OF HADDOCK ACTOMYOSIN. I. AMMONIA FORMATION

Nottingham, P. M.
Journal of the Science of Food and Agriculture 6, No. 2, 82-86 (February 1955)

(Abstract of this article appears under 0.32 page 1)

1.5 THE ALKALINE HYDROLYSIS OF HADDOCK ACTOMYOSIN. II. PEPTIDE-BOND HYDROLYSIS

Nottingham, P. M.
Journal of the Science of Food and Agriculture 6, No. 2, 86-90 (February 1955)

(Abstract of this article appears under 0.32 page 1)

1.81 DETERMINATION OF COOK DRIP IN PACIFIC OCEAN PERCH (SEBASTODES ALUTUS) AND BY PACIFIC OYSTERS (OSTREA GIGAS) BY USE OF A NEW METHOD

Sumerwell, William N.
Commercial Fisheries Review 17, No. 3, 18-21 (March 1955)

(Abstract of this article appears under 3.249 page 17)

1.81 THE EFFECT OF SALT, VINEGAR, AND HEAT ON THE COLIFORMS IN OYSTERS

Salafranca, Enrique S.
Philippine Journal of Fisheries 2, No. 1, 93-107 (January-June 1953)

(Abstract of this article appears under 2.05 page 5)

1.81 OYSTER CULTURE AND CLAM FISHING, PRINCE EDWARD ISLAND

MacBride, E. W. (McGill University, Montreal)
Contributions to Canadian Biology, 217-220 (1912)

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Archives of Biochemistry and Biophysics
Biochemical Journal
Bulletin of the Faculty of Fisheries, Hokkaido University
Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
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Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
Journal of the Association of Official Agricultural Chemists
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Modern Packaging
Modern Refrigeration
National Fisherman
National Provisioner
Nature
Nutrition Reviews
Pacific Fisherman
Pan American Fisherman
Poultry Science
Practical Home Economics
Progressive Fish-Culturist
Quick Frozen Foods
Refrigerating Engineering
Report of the Food Investigation Board (Great Britain)
Science
Southern Fisherman
Trade News (Fisheries Department, Canada)
Western Fisheries
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above listed publications are included. Biological papers are generally omitted.

2.114 HOW TO REDUCE CORROSION IN BRINE SYSTEMS

Joselyn, H. Nye
National Provisioner 132, No. 6, 55-56, 80 (February 5, 1955)

(Abstract of this article appears under 3.231 page 7 - June 1955 issue)

2.114 FLUID DRIVES IMPROVE TRAWL WINCH OPERATION ON FISHING BOATS

Anonymous
National Fisherman 36, No. 2, 30 (March 1955)

2.114 SECURING RUDDER EFFICIENCY

Anonymous
Fishing Gazette 71, No. 4, 154 (April, 1954)

2.19 PEN SURFACES AND ODOUR DEVELOPMENT IN TRAWLER FISH HOLDS

MacCallum, W. A.
Food Technology 9, No. 5, 251-253 (May 1955)

(Abstract of this article appears under 2.15 page 19 - July 1955 issue)

2.19 REFRIGERATION OF TUNA AND SARDINES BY SODIUM CHLORIDE BRINES

Farber, Lionel
Food Technology 9, No. 3, 141-147 (March 1955)

(Abstract of this article appears under 2.15 page 19 - May 1955 issue)

2.19 THE INFLUENCE OF THE QUALITY OF THE FISH IN THE FISH PLANT ON THE SUBSEQUENT KEEPING TIME IN RETAIL STORES IN ONTARIO

Castell, C. H.; MacCallum, W. A.; and Power, H. E.
Fisheries Research Board of Canada, Progress Reports of the Atlantic Coast Stations, No. 60, 9-13 (December 1954)

(Abstract of this article appears under 2.00 page 1 - April 1955 issue)

2.9 THE ALIMENTARY VALUE OF FISHERY PRODUCTS

Causeret, Jean
Bull. soc. sci. hyg. aliment. 38, 13-39 (1950)
Chemical Abstracts 44, No. 21, 10203 (1950)

2.9 RISKS OF THE CONSUMPTION OF FISH, CRUSTACEANS AND MOLLUSKS AND THEIR PREVENTION

Fournier, Paul
Bull. soc. sci. hyg. aliment. 38, 40-57 (1950)
Chemical Abstracts 44, No. 21, 10203 (1950)

2.9 STUDIES ON THE NUTRITIVE VALUE AND ABSORPTION COEFFICIENT OF "SURUME-IKA" (OMMASTREPHES SLOANI PACIFICUS) PROTEIN

Yoshimura, Katsuji and Nara, Sakan
Bulletin of the Faculty of Fisheries, Hokkaido University 5, No. 1, 94 (May 1954)

The nutritional value of surume-ika protein is inferior not only to other animal protein but to the prominent standard casein diet as well. The absorption coefficient of surume-ika protein is about 75-80% and somewhat inferior to beef or casein but as effective as other animal protein.

2.9 GLOBEFISH POISON

Shirotak, N.; Fujita, K.; and Kawamura, M.
Ann. Rept. Takamine Lab. 4, 45-9 (1952)
Chemical Abstracts 49, No. 5, 3474 (1955)

2.9 FISH POISONING CAUSED BY HISTAMINE IN INDONESIA

van Veen, A. G. and Latuasan, H. E.
Documenta Neerland. et Indones. Morbis Trop. 2, 18-20 (1950)
Chemical Abstracts 44, No. 16, 7458 (1950)

2.9 THIAMINASE, THE CHASTEK-PARALYSIS FACTOR

Yudkin, Warren H.
Physiol. Revs. 29, 389-402 (1949)
Chemical Abstracts 44, No. 7, 3108 (1950)

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6.15 CONDENSED WHALE SOLUBLES. THE EVALUATION OF THIS BYPRODUCT OF THE WHALING INDUSTRY WHEN FED AS THE ANIMAL PROTEIN SUPPLEMENT TO THE RATIONS OF PIGS AND POULTRY

Allden, W. G.; Sangster, R. M.; and Jones, M. D.
J. Agr. S. Australia 58, 158-161 (1954)
Chemical Abstracts 49, No. 6, 4203 (1955)

Condensed whale solubles (54.1% crude protein) satisfactorily replaced meat meal at the same level of animal protein in pig rations, and no taint was detected in the flesh. Min. level of whale solubles giving satisfactory growth of pigs was 14% of basal cereal ration. Laying poultry receiving supplement of whale solubles (9%) and green feed to basal cereal ration averaged 195 eggs per bird per year compared with 202 from meat meal.

6.15 AN OUTLINE ON THE UTILIZATION OF STICKWATER AND THE WORKING PRINCIPLES OF STICKWATER RECOVERY PLANTS

Solheim, Peder
Norwegian Fishing News 2, No. 2, 4 (March 1955)

6.15 CONCENTRATED FISH PRESS LIQUOR

Gunther, James K. and Sair, Louis
U. S. patent 2,525,294 (October 10, 1950)
Chemical Abstracts 45, No. 2, 786 (1951)

6.3 THE DEGRADATION OF CARRAGEENIN. I. KINETICS IN AQUEOUS SOLUTION AT pH 7

Masson, C. R.
Canadian Journal of Chemistry 33, No. 4, 597 (April 1955)

The degradation of carrageenin in buffered aqueous solution at pH 7.0 has been studied over the temperature range 60° to 101°C. by following the change in viscosity and reducing properties.

6.3 STUDIES ON COLLOIDAL EQUILIBRIUM OF DILUTED ALGIN SOLUTION. III. RELATION BETWEEN ELECTRIC DISSOCIATION AND COLLOIDAL BEHAVIOR IN DILUTED SODIUM-ALGINATE SOLUTION

Kato, Kenji
Bulletin of the Faculty of Fisheries, Hokkaido University 4, No. 2, 163 (August 1953)
(English summary, tables, and figures)

6.3 DERIVATIVES OF ALGINIC ACID

Wintter, J. E.; Lauter, W. M.; and Foote, P A.
J. Am. Pharm. Assoc. 44, 48-51 (1955)
Chemical Abstracts 49, No. 6, 4238 (1955)

6.3 SELECTED BIBLIOGRAPHY ON ALGAE. NO. 3

Campbell, Evelyn M. and Heaps, Doreen
Nova Scotia Research Foundation, Halifax, January 1955

6.3 ALGINOUS GUM PRODUCT

Le Gloahec, Victor C. E.
U. S. patent 2,513,416 (July 4, 1950)
Chemical Abstracts 44, No. 20, 9592 (1950)

6.3 STUDIES ON MECHANISMS OF MANUFACTURING ALGIN. PART V. AMENDED THEORY ON MECHANISM OF MANUFACTURING ALGIN

Suzuki, Noboru
Bulletin of the Faculty of Fisheries, Hokkaido University 5, No. 1, 20 (May 1954)

The solubilities, ionization constants, dissociation degrees, pH values and pK values of saturated alginic acid solutions were determined under several conditions. The amended theory of manufacturing algin from brown algae is described from the viewpoint of the cation exchange reaction.

6.86 PHYSICO-CHEMICAL STUDIES ON THE SKIN AND LEATHER OF MARINE ANIMALS. IX. SWELLING OF SHARK SKIN (1)

Takahashi, Toyo-o
Bulletin of the Japanese Society of Scientific Fisheries 19, No. 12, 1203 (1954) (English summary, figures and tables)

6.86 PHYSICO-CHEMICAL STUDIES ON THE SKIN AND LEATHER OF MARINE ANIMALS. VIII. ON THE HEAT STABILITY OF FISH SKIN AND LEATHER (3)

Takahashi, Toyo-o and Tanaka, Takeo
Bulletin of the Japanese Society of Scientific Fisheries 19, No. 4, 603-10 (August 25, 1953)
(English summary, figures and tables)

6.86 THE FUNCTIONS OF HYDROXYPROLINE IN COLLAGENS

Gustavson, K. H.
Nature 175, No. 4445, 70-74 (January 8, 1955)

(Abstract of this article appears under 8.51 page 17 - July 1955 issue)

9.11 OCEANOGRAPHIC OBSERVATIONS IN FLORIDA WEST COAST WATERS, 1949-52

Marvin, Kenneth T.
Special Scientific Report: Fisheries No. 149 (May 1955)

"Presented in tables I through XXVII are data collected between 1949 and 1952, which includes phosphorus data already presented by Graham et al. (1954). These data will be used for comparison with more recent findings and are presented here for use by scientists engaged in red-tide research."

9.11 PACIFIC OCEANIC FISHERIES INSTITUTE

Anonymous
Pan American Fisherman 9, No. 11, 12-13, 20 (June 1955)

(Abstract of this article appears under 1.0112 page 19)

9.11 CONDITIONS FOR TROLL FISHING

Tully, John P.
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 101, 12-16 (December 1954)

(Abstract of this article appears under 2.14 page 3 - July 1955 issue)

9.17 WOODS HOLE BIOLOGISTS EXPERIMENTING TO FIND BEST MESH SIZE FOR WHITING

Anonymous
Maine Coast Fisherman 9, No. 9, 23-25 (April 1955)

(Abstract of this article appears under 2.1121 page 19 - June 1955 issue)

9.17 OTTER-TRAWL MESH EXPERIMENTS WITH DOVER SOLE

Westrheim, Sigurd J.
Progressive Fish Culturist 16, No. 4, 184-185 (October 1954)

(Abstract of this article appears under 2.1121 page 13 - February 1955 issue)

9.17 THE SABLEFISH FISHERY OF BRITISH COLUMBIA

Ketchen, K. S. and Forrester, C. R.
Pacific Marine Fisheries Commission, Bulletin 3, 58-72 (1954) Portland, Oregon

(Abstract of this article appears under 1.5 page 3)

9.2 FISH MEAL AND OIL IN 1953

Power, Edward A.
Fishing Gazette 70, No. 13, 230, Annual Review Number, 1954

9.2 DANISH FISHING INDUSTRY FOR 1953

Anonymous
Fisheries Report for the Year 1953, 7-10 (1953)

(Abstract of this article appears under 1.0142 page 7 - December 1954 issue)

9.2 EARNINGS SURVEY

Anonymous
Western Fisheries 49, No. 5, 12-16, 48-49 (February 1955)

(Abstract of this article appears under 1.3 page 13 - June 1955 issue)

9.7 NEED FOR TRAINING FROZEN FOOD SPECIALISTS

Schauffer, Harry K.
Southern Fisherman XV, No. 3, 33-35 (March 1955)

(Abstract of this article appears under 3.26 page 17)

9.7 QUALITY CONTROL MAN OF TOMORROW

Gould, Wilbur A.
Food Packer 36, No. 5, 38-39, 42 (May 1955)

(Abstract of this article appears under 0.6 page 19 - July 1955 issue)

9.7 INTERNATIONAL FISHING SCHOOL HELD IN MEXICO

Anonymous
Southern Fisherman 14, No. 12, 48 (December 1954)

The course covered all phases of commercial fishing and was of 10 weeks' duration.

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